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AMLaP Asia

Architectures and Mechanisms for Language Processing Asia

December 1-3, 2023

Hong Kong

Program Summary

Day 1		
8:50	Organizers Welcome	
9:00	Keynote	Ping Li
10:00	Talk	Aine Ito, Huong Thi Thu Nguyen and Pia Knoeferle
10:20	Talk	Akari Ohba and Kamil Deen
10:40	Coffee break	
11:00	Talk	Chi Zhang and Min Wang
11:20	Talk	Hang Wei, Maggie Hsu and Julie Boland
11:40	Talk	Xufeng Duan, Yanfang Su, Kanglong Liu and Zhenguang Cai
12:00	Talk	Sho Akamine, Akari Omine, Tsuyoshi Kohatsu, Keiyu Niikuni and Manami Sato
12:20	Lunch/poster	Poster Session 1
14:20	Symposium	Defeng Li
14:45	Symposium	Dechao Li
15:10	Symposium	Adolfo Garcia
15:35	Symposium	Yanping Dong
16:00	Coffee break	
16:20	Keynote	Dale Barr

Day 2		
9:00	Keynote	Susan Goldin-Meadow
10:00	Talk	Cecile Larralde and Ira Noveck
10:20	Talk	Conghui Zhu and Fuyun Wu
10:40	Coffee break	
11:00	Talk	Qianqian Ren, Chin Lung Yang and Haihua Pan
11:20	Talk	Ruoyu Ma and Fuyun Wu
11:40	Talk	Wen Cui and Heeju Hwang
12:00	Talk	Yajiao Shi, Wenshuo Chang, Yanbin Hu, Shen Xu and Xiaolin Zhou
12:20	Lunch/poster	Poster Session 2
14:20	Talk	Masataka Yano, Keiyu Niikuni, Ruri Shimura, Natsumi Funasaki and Masatoshi Koizumi
14:40	Talk	Shunjie Xing and Jing Yang
15:00	Talk	Wenyi Zhang and Zhenguang Cai
15:20	Talk	Xiaohong Yang and Zihang Zhou
15:40	Talk	Yuan Xie, Peng Zhou, Likan Zhan and Yanan Xue
16:00	Coffee break	
16:20	Keynote	Patrick Wong

Day 3		
9:00	Keynote	Richard Futrell
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10:20	Talk	Zhengwu Ma, Chengcheng Wang and Jixing Li
10:40	Coffee break	
11:00	Talk	Bei Li, Bruce Xiao Wang, Si Chen, Caicai Zhang, Puiyin Lau and Yike Yang
11:20	Talk	Hailin Hao, Zuzanna Fuchs and Shravan Vasishth
11:40	Talk	Chia-Fang Cheng and Ya-Ning Chang
12:00	Talk	Bo Yao and Ryan Horsfall
12:20	Lunch/poster	Poster Session 3
14:20	Talk	Jen Lewendon, Jueyao Lin and Stephen Politzer-Ahles
14:40	Talk	Kayla Keyue Chen and Wing-Yee Chow
15:00	Talk	Yanjun Wei, Jianqin Wang, Huiping Wang and Pedro Paz-Alonso
15:20	Talk	Yanxin (Alice) Zhu and Theres Grüter
15:40	Talk	Ping Tang
16:00	Coffee break	
16:20	Keynote	Cammie McBride

Day 1 Stage Presentations

Presentation	Author	Title
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Talk	Aine Ito, Huong Thi Thu Nguyen and Pia Knoeferle	GERMAN-DOMINANT VIETNAMESE HERITAGE SPEAKERS USE SEMANTIC CONSTRAINTS OF GERMAN FOR ANTICIPATION DURING COMPREHENSION IN VIETNAMESE
Talk	Akari Ohba and Kamil Deen	Why children (incorrectly) accept inverse scope: inverse scope derived from generalized distributivity
Talk	Chi Zhang and Min Wang	Effects of input type frequency on structural priming and statistical preemption in the acquisition of L2 dative construction
Talk	Hang Wei, Maggie Hsu and Julie Boland	Shared hierarchical representations in bilinguals: evidence from cross-linguistic structural priming in chinese-english sentence comprehension
Talk	Xufeng Duan, Yanfang Su, Kanglong Liu and Zhenguang Cai	Chinese translations of English words: A comparison between human and ChatGPT translations
Talk	Sho Akamine, Akari Omine, Tsuyoshi Kohatsu, Keiyu Niikuni and Manami Sato	Visual perception and physical action in valence word learning
Symposium	Defeng Li	Exploring the Neurocognitive Correlates: Bilingual Profiles and Cognitive Processing in Oral Interpretation through fMRI
Symposium	Dechao Li	Exploring the enhancement of translator's profile in cognitive processing: a process- and product-oriented comparison between translation and paraphrasing
Symposium	Adolfo Garcia	Neurocognitive signatures of translation directionality
Symposium	Yanping Dong	How does Working Memory Function in the Development of the Complex Language Skill of Interpreting?
Keynote	Dale Barr	On the weak explanatory power of belief reasoning in language processing: Now what?

Day 2 Stage Presentations

Presentation	Author	Title
Keynote	Susan Goldin-Meadow	The mind hidden in our hands
Talk	Cecile Larralde and Ira Noveck	Inferences in isolation: an EEG study of discourse connectives
Talk	Conghui Zhu and Fuyun Wu	Evaluating bayesian models of pronoun interpretation with mandarin story continuation data
Talk	Qianqian Ren, Chin Lung Yang and Haihua Pan	PROCESSING LINGUISTIC FOCUS IN DISCOURSE: EYE MOVEMENTS IN READING MANDARIN CHINESE
Talk	Ruoyu Ma and Fuyun Wu	Locality Bias in Processing Chinese Reflexives Ziji and Ta-ziji: Evidence from Self-paced Reading
Talk	Wen Cui and Heeju Hwang	The Influence of Topicality on Interpretation of Null and Overt Pronouns in Mandarin
Talk	Yajiao Shi, Wenshuo Chang, Yanbin Hu, Shen Xu and Xiaolin Zhou	The dissociable two-stage processing of ironic criticism and ironic compliment
Talk	Masataka Yano, Keiyu Niikuni, Ruri Shimura, Natsumi Funasaki and Masatoshi Koizumi	Why do speakers use syntactically non-basic sentences? Evidence from pupillometry and functional near-infrared spectroscopy
Talk	Shunjie Xing and Jing Yang	CONTRIBUTIONS OF INTERPRETING TRAINING TO BILINGUALS' ATTENTIONAL NETWORKS AND THEIR DYNAMICS
Talk	Wenyi Zhang and Zhenguang Cai	Modelling interlocutor linguistic competence in linguistic updating
Talk	Xiaohong Yang and Zihang Zhou	Domain general cognitive control brain networks are associated with the development of children's language abilities
Talk	Yuan Xie, Peng Zhou, Likan Zhan and Yanan Xue	[Withdrawn]Low-frequency Neural Activity Tracks Semantic Properties of Mandarin Words
Keynote	Patrick Wong	Learner-internal and -external factors in language learning

Day 3 Stage Presentations

Presentations	Author	Title
Keynote	Richard Futrell	Limits of information processing in language comprehension and production
Talk	Zhenguang Cai, Xufeng Duan, Lu Sun and Martin Pickering	Structural priming in ChatGPT
Talk	Zhengwu Ma, Chengcheng Wang and Jixing Li	Syntactic information drives language models' alignment with human comprehension processes
Talk	Bei Li, Bruce Xiao Wang, Si Chen, Caicai Zhang, Puiyin Lau and Yike Yang	Talker normalisation of prosodic cues in non-native speakers
Talk	Hailin Hao, Zuzanna Fuchs and Shravan Vasishth	Similarity-based interferences in Chinese classifier-noun dependencies
Talk	Chia-Fang Cheng and Ya-Ning Chang	The effects of semantic radical consistency on chinese character naming: a corpus-based approach
Talk	Bo Yao and Ryan Horsfall	Does inner speech in silent reading facilitate emotional processing?
Talk	Jen Lewendon, Jueyao Lin and Stephen Politzer-Ahles	Bilingual language coactivation – translation equivalents or conceptual overlap?
Talk	Kayla Keyue Chen and Wing-Yee Chow	Rapid semantic updating despite prediction errors: eye-tracking evidence from Mandarin Chinese
Talk	Yanjun Wei, Jianqin Wang, Huiping Wang and Pedro Paz-Alonso	Frontoparietal interactions underlay visuospatial orthographic processes in chinese reading
Talk	Yanxin (Alice) Zhu and Theres Grüter	L1 and L2 mandarin speakers predict upcoming arguments in dative constructions based on categorical and gradient verb information
Talk	Ping Tang	Audiovisual perception of mandarin tones by children with cochlear implants
Keynote	Cammie McBride	How Chinese changed my (research) life

Day 1 Poster Presentations

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P104	Annie Zeng, Michael Jin and Quoc Vuong	DEEP OR NOT? SPEECH PROCESSING IN SIMULTANEOUS INTERPRETING
P105	Anupama Reddy and Kamil Deen	SYNTACTIC BOOTSTRAPPING IN MARATHI
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P110	Chuchu Li, Katherine J. Midgley, Victor S. Ferreira, Phillip J. Holcomb and Tamar H. Gollan	DIFFERENT LANGUAGE CONTROL MECHANISMS IN COMPREHENSION AND PRODUCTION: EVIDENCE FROM PARAGRAPH READING
P111	Chui Yin Ng and Heeju Hwang	Predictability effect on pronoun interpretation in Mandarin
P112	Daniel Gallagher, Masataka Yano and Shinri Ohta	MODALITY-SPECIFIC LANGUAGE PROCESSING OF SPANISH MORPHOSYNTACTIC AND ORTHOGRAPHIC/PHONOLOGICAL VIOLATIONS: AN ERP STUDY
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P122	Fei Yuan and Jiexuan Lin	HOW MUCH INFORMATION IS ENOUGH FOR THE PHONEMIC RESTORATION TO OCCUR? EVIDENCE FROM MANDARIN CHINESE
P124	Feier Gao and Charles Lin	Frequency effects in the lexical access that involves phonological alternation: Evidence from Mandarin tone 3 sandhi
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P129	Haoyan Ge, Hoi Kwan Yuen and Virginia Yip	BILINGUAL EXPOSURE DOES NOT IMPEDE CANTONESE-ENGLISH BILINGUAL AUTISTIC CHILDREN'S RECEPTIVE VOCABULARY IN L1 CANTONESE
P130	Qiaoyao Zhao and Xin Kang	INFLUENCE OF MUSICAL EXPERIENCE ON LANGUAGE LEARNERS' DISCRIMINATION OF JAPANESE PITCH ACCENT: EVIDENCE FROM NARIVE SPEAKERS OF MANDARIN CHINSES
P132	Hua Yuan and Nan Jiang	Classifiers and categorization of objects by native and nonnative speakers of Chinese
P133	Huan Liu, Ruiyong Liu and Shifa Chen	ON THE USE OF IMPLICIT CAUSALITY INFORMATION IN ENGLISH PRONOUN ANAPHORIC INFERENCE: EVIDENCE FROM CHINESE SECOND LANGUAGE LEARNERS' EYE MOVEMENTS
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Day 3 Poster Presentations

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Day 1 Stage Presentations

December 1, 2023

Multimodal language learning and knowledge representation: Cognitive and neural mechanisms (多模态语言学习及知识表征的认知神经机制)

Ping Li
Hong Kong Polytechnic University

Abstract

In an era of rapid developments in digital technology and AI, we need to examine the mechanisms of language learning and processing from an integrative neurocognitive perspective. In this talk, I outline an approach that combines emerging technologies and data-driven methodologies with current neurocognitive theories, with particular reference to embodied learning. I highlight the interactive mechanisms and integrative processes that enable us to understand the differences between child and adult language learning, as well as individual differences in diverse language learning contexts. The key to this approach is the understanding of how human learners effectively integrate multimodal information in a social interactive context. Theoretically, this approach allows us to gain a deeper insight into embodied language learning and its underlying neural mechanism through collecting and analyzing real-time multimodal data. Practically, it emphasizes context-based communicative abilities, which allows us to develop personalized pedagogical designs that tailor to individual learners' needs and learning profiles.

About the speaker

Ping Li is Sin Wai Kin Professor in Humanities and Technology, Chair Professor of Neurolinguistics and Bilingual Studies, and Dean of the Faculty of Humanities at the Hong Kong Polytechnic University. He previously served as President of the Society for Computation in Psychology and Program Director at the U.S. National Science Foundation while being a Professor of Psychology, Linguistics, and Information Sciences at the Pennsylvania State University. Li's research is focused on investigating the neurocognitive and computational bases of language acquisition, bilingualism, and reading comprehension in both children and adults. He uses digital technologies and cognitive neuroscience methods to study neuroplasticity and individual differences in learning in an effort to understand the relationships among language, culture, technology, and the brain. Li is currently Editor-in-Chief of *Brain and Language* and Senior Editor of *Cognitive Science*. He is a Fellow of the American Association for the Advancement of Science (AAAS).

李平，香港理工大學中文及雙語學系神經語言學及雙語學講座教授，冼爲堅基金人文與技術講席教授，併兼任人文學院院長及神經科學中心實驗室副主任。曾任職美國賓夕法尼亞州立大學心理學、語言學、信息科學與技術專業終身教授, 心理與計算科學協會主席(2012)及美國國家科學基金會的認知神經科學計劃主任 (2007-2009)。目前是 Brain and Language 的主編，Cognitive Science 資深主編。他也於 2021 年被選爲美國科學促進會會士。李平在心理語言學，語言習得，計算機模型及雙語的認知神經機制等領域出版了大量的研究專著及 200 餘篇學術論文。有關李平教授研究的更多信息，請訪問 http://blclab.org/

GERMAN-DOMINANT VIETNAMESE HERITAGE SPEAKERS USE SEMANTIC CONSTRAINTS OF GERMAN FOR ANTICIPATION DURING COMPREHENSION IN VIETNAMESE

Aine Ito (aine.ito@nus.edu.sg), Huong Thi Thu Nguyen & Pia Knoeferle

Native language (L1) speakers often anticipate upcoming words (e.g., anticipating edible objects upon hearing "eat" [1]), but non-native language (L2) speakers do so less, particularly when they process linguistic features that are specific to the L2 [2]. A possible account for this difference is that the dominant language influences non-dominant language processing. To test this, we investigated whether Vietnamese heritage speakers' anticipation is influenced by their dominant language German. They started acquiring Vietnamese as early as L1 Vietnamese speakers but later became dominant in German. We tested anticipation based on **classifier constraints** (which do not exist in German) and **verb constraints** (which often differ from those in German, e.g., The Vietnamese verb *mặc* 'wear' can take a shirt but not an earring as a grammatical object, whereas the translation-equivalent German verb *tragen* can take both a short and earrings as a grammatical object).

30 L1 Vietnamese-L2 German speakers and 30 Vietnamese heritage speakers listened to Vietnamese sentences (e.g., *Nam mặc*$_{\text{-verb}}$ *một chiếc*$_{\text{-classifier}}$ *áo*; 'Nam wears$_{\text{-verb}}$ one [classifier] shirt') while viewing 4 objects: **target**, **competitor** and 2 **distractors** (i.e., visual world eye-tracking). Each sentence contained a verb that had either a **different mapping** (e.g., *mặc* – *tragen*) or **similar mapping** (e.g., *phơi* – *trocknen* 'dry') between Vietnamese and German. The competitor was plausible to follow after the similar mapping verb and implausible after the different mapping verb but plausible after the German translation-equivalent of the different mapping verb. The classifier was either **shared** or **not shared** between the target (shirt) and the competitor (earrings; when it was not shared, only the target met the classifier constraints). If people use the verb and classifier constraints efficiently, we expected more fixations on objects meeting (vs. not meeting) the verb/classifier constraints. Additionally, if the dominant language influences anticipation, heritage speakers may anticipate German-verb compatible objects and fixate both the target and the competitor upon hearing the different mapping verb (although the competitor was not compatible with the verb in Vietnamese).

Linear mixed-effects models in the verb and classifier windows showed that both groups were more likely to fixate the verb- and classifier-compatible objects upon hearing the verb/classifier, suggesting that both groups used verb- and classifier constraints for anticipation. L1 Vietnamese speakers showed more looks to the target over the competitor than heritage speakers, suggesting more efficient disambiguation in L1 Vietnamese speakers. An exploratory divergence point analysis showed similarly early disambiguation in both groups when the verb did not help disambiguation between the target and the competitor. However, when the verb mapping was different in Vietnamese and German, heritage speakers fixated the verb-compatible target about 1500 ms later than L1 Vietnamese speakers. Heritage speakers were distracted by the competitor that was compatible with the translation-equivalent German verb, suggesting an influence of the dominant language on anticipation in the heritage language.

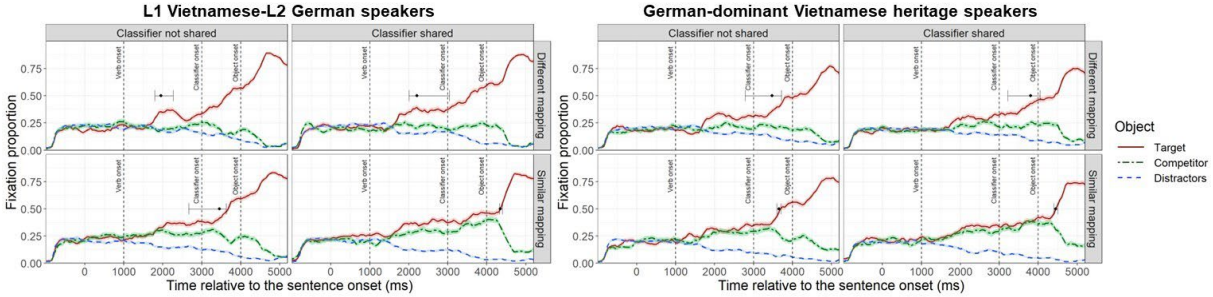

Figure 1. Fixation proportion for each object, condition and group. The dot in each plot shows the mean divergence point between the target and competitor fixations with 95% CIs.

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WHY CHILDREN (INCORRECTLY) ACCEPT INVERSE SCOPE: INVERSE SCOPE DERIVED FROM GENERALIZED DISTRIBUTIVITY

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Introduction: Doubly-quantified sentences (e.g., *Someone caught every cat*) allow inverse scope in languages like English, but not in Japanese, Mandarin or German.

(1) a. Surface scope (*some* > *every*): ☑There is someone who caught every cat.
b. Inverse scope (*every* > *some*): *For every cat, there is someone who caught it.

Nonetheless, Japanese/Mandarin/German children (incorrectly) permit inverse scope (Chien & Wexler, 1989; Goro, 2007; Sano, 2004; Szendrői et al., 2017). Previous studies have proposed several theoretical explanations, while no study has experimentally investigated the source of children's non-adult-like behavior. Here we provide a novel explanation for Japanese children's acceptance of inverse scope: a generalized preference for distributive interpretations over collective.

In the typical doubly-quantified construction used in previous research (existentially-quantified subject and universally-quantified object), the surface scope reading depicts a collective scene (1a) and the inverse scope reading depicts a distributive scene (1b). Independently from this, children are known to prefer to interpret numerals/quantifiers distributively, differently from adults (Syrett & Musolino, 2013; Rouweler & Hollebrandse, 2015): When hearing a sentence (2), children prefer the distributive (each boy is pushing a car) over the collective (two boys are pushing a car together), while adults prefer the collective.

(2) *Two boys are pushing a car*.

A generalized preference for distributivity might lead children to select pictures that correspond to the inverse scope reading, thus giving the non-adult-like behavior. We conducted two experiments testing for a correlation between children's incorrect acceptance of the inverse scope reading in doubly-quantified sentences and their preference for a distributive interpretation of plural expressions.

Study: Two experiments (within-subjects) tested Japanese-acquiring children's (4;6-6;1, Mean: 5.49) interpretation of doubly-quantified sentences (Experiment 1) and distributivity/collectivity preference on plural expressions (Experiment 2).

Experiment 1 (TVJT, Crain & Thornton, 1998): 4 doubly-quantified sentences (plus practice and fillers). The doubly-quantified sentences (3) were presented after a story where the inverse scope reading is true.

(3) *Umm, dareka-ga dono-tori-mo tsukamae-ta to omou.*
Umm someone-NOM every-bird catch-PST COMP think
'Umm, I think someone caught every bird.'

Experiment 2 (Picture-selection): Conducted on a different day to Experiment 1; 4 sentences with a plural subject (4) (plus practice and fillers). Each test sentence was presented with a distributive picture and a collective picture, and children are asked to pick one of the pictures.

(4) *Doubutsu-san-tati-ga okasi-o tsukut-ta.*
animal-POLITE-PLURAL-NOM sweet-ACC make-PST
'Animals made (a) sweet.'

Results: For Experiment 1, children accepted the inverse scope reading in doubly-quantified sentences 52.2% of the time, significantly higher than adults (27.5%). However, children can be divided into two groups (Table 1): Children who consistently rejected inverse scope (0% acceptance as a group) and children who consistently accepted inverse scope (95% acceptance as a group). Most importantly, we found that children who incorrectly accepted the inverse scope reading chose the distributive picture 91.6% of the time, while children who correctly rejected this reading chose the distributive picture only 45% of the time, and this correlation was significant (p = 0.041).

Table 1: Correlation between Exp. 1 and Exp. 2

	% acceptance of inverse scope in Exp. 1	% selection of the distributive picture in Exp. 2
Children who **correctly rejected** inverse scope	0%	45%
Children who **incorrectly accepted** inverse scope	95%	91.6%

The correlation was significant (p = 0.041, SE = 3.1).
Model: glmer(Acceptance_of_inverse_scope + Times_to_select_distributive_picture + (1|ParticipantID) + (1|Item), family="binomial")

We conclude that those children who do not have the preference for the distributive reading can also reject the inverse scope reading of doubly-quantified sentences, showing that children's non-adult-like behavior with doubly-quantified sentences may derive from the previously-documented generalized preference for distributive interpretations.

EFFECTS OF INPUT TYPE FREQUENCY ON STRUCTURAL PRIMING AND STATISTICAL PREEMPTION IN THE ACQUISITION OF L2 DATIVE CONSTRUCTION

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Second language (L2) learners usually have difficulty in learning dative constructions, particularly in abstracting double object (DO) structure (e.g., *John gave Mary a necklace*) and prepositional dative (PD) structure (e.g., *John gave a necklace to Mary*). L2 learning of dative constructions requires learners to extend the acceptability of less preferred structures but avoid excessively accepting certain combinations between verbs and structures that are ungrammatical (e.g., * *John donated a necklace to Mary*). However, it was still unclear how L2 learning results in overgeneralization in the first place. Overgeneralization might be caused by structural priming, that is the persistence of syntactic structures between language input and production/comprehension (Ivanova et al., 2012). In addition, it was suggested that L1 learners constrain the overgeneralized form via statistical preemption (Boyd & Goldberg, 2011), whereby they take the repeated input of structure X (e.g., non-generalizable PD) as indirect negative evidence of the appropriateness of a semantically related structure Y (DO) in the same context. However, it is still debatable whether statistical preemption affects L2 learners' language generalization. Finally, high variability in verbs (i.e., high type frequency) would increase the productivity of the input structure (Goldberg, 2019), but the effect of such a statistical feature on L2 learning has not yet been elucidated.

To test the above questions, the present study investigated the effects of structural priming and statistical preemption on L2 learning of DO structure, and how the type frequency of the input modulates these effects. Chinese L2 English learners (N=188) were randomly assigned to two pretest-exposure-posttest experiments. In both experiments, the experimental groups received input of English dative sentences during the exposure session (DO in Experiment 1, DO and non-generalizable PD in Experiment 2). The type frequency of the DO input was manipulated between groups in Experiment 1 (HDZP vs. LDZP) and that of the non-generalizable PD input was manipulated between groups in Experiment 2 while the input type frequency of DO was kept high (HDHP vs. HDLP). The production of dative structures for each group was assessed before, immediately after, and two days after exposure. The findings were two-fold: first, there were both short-term and long-term effects of structural priming on well-formed and overgeneralized production (i.e. the likelihood of well-formed and overgeneralized DO production increased in the posttests, see Figure 1) and statistical preemption (i.e., the likelihood of overgeneralized DO production was lower in the posttests of HDHP vs. HDZP); second, in terms of the DO overgeneralization, the short-term effect of type frequency was found on structural priming and statistical preemption, while the long-term effect of type frequency was found on preemption. In sum, in two experiments, we showed that L2 learners' overgeneralization, and avoidance of overgeneralization in dative learning can be driven by structural priming and statistical preemption. Both processes are sensitive to input type frequency. These findings provide evidence in support that statistical-driven processes can facilitate L2 learners to recover from conservativity and overgeneralization.

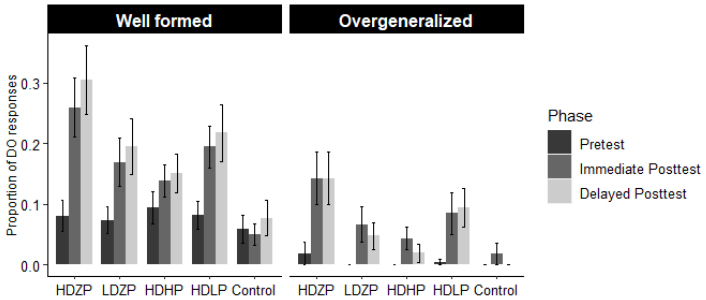

Figure 1. Proportion of DO responses collapsed by group, phase, and production type. HDZP = High type frequency DO, Zero PD, LDZP = Low type frequency DO, Zero PD, HDHP = High type frequency DO, High type frequency PD, HDLP = High type frequency DO, Low type frequency PD.

SHARED HIERARCHICAL REPRESENTATIONS IN BILINGUALS: EVIDENCE FROM STRUCTURAL PRIMING IN CHINESE-ENGLISH SENTENCE COMPREHENSION

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Evidence from cross-linguistic structural priming suggests that syntactic representations are shared between the bilingual's two languages (Hartsuiker et al., 2004, 2016). It remains unclear, however, whether bilingual representations are shared at the hierarchical structure or at surface constituent structure. Current evidence comes mainly from priming in production.

The present study investigated cross-linguistic comprehension priming of relative clause and dative constructions in Chinese-English late bilinguals. In two word-by-word, self-paced reading experiments, participants read target sentences consisting of English double-object (DO) or relative clause construction (RC), with DOs having the same hierarchical structure and surface word order (SVO) in English and Chinese, while RCs having the same hierarchical but different surface word orders (English: S-RC-V; Chinese: RC-S-V). Each RC target (1a) was preceded by either a Chinese RC (1b) or a main clause (MC, 1c) prime, and each DO target (2a) was preceded by either a Chinese DO (2b) or a prepositional-object (PO, 2c) prime.

1(a) RC target	*The speaker selected by the group would be perfect for the program.*
1(b) RC prime	那个被组委会选中的学生成绩优秀。
	the BEI (passive) committee select DE (relativizer) student perform well
	The student selected by the committee had excellent performance.
1(c) MC prime	组委会选中了那个成绩优秀的学生。
	committee select LE (perfective) the performance excellent DE student
	The committee selected the student who had excellent performance.
2(a) DO target	*The freshman showed his parents his grades.*
2(b) DO prime	那位司机出示给门卫一张名片。
	the driver showed guard one-classifier visiting card
	The driver showed the guard a visiting card.
2(c) PO prime	那位司机出示了一张名片给门卫。
	the driver showed one-classifier visiting card to guard
	The driver showed a visiting card to the guard.

Each experiment contained 28 RC prime-target pairs and 28 dative pairs. In Exp. 1, the head verbs in each prime-target pair were translation equivalents (e.g., *selected* vs. *xuǎnzhòng*; *showed* vs. *chūshì*); in Exp. 2, prime and target used unrelated verbs. Eighty late C-E bilinguals participated in the study, with 40 in each experiment. On the basis of prior research (Hsieh, 2017; Tooley & Bock, 2014), we expected to observe faster RTs on the critical (underlined in 1a and 2a) and/or spillover region (one word following the critical region) of the targets when they were preceded by primes of the same structure relative to primes of the alternate structure.

The results of Exp.1 showed that for RC targets, significant priming occurred in the critical ($b = -0.033$, $SE = 0.013$, $t = -2.463$, $p = .014$) and spillover region ($b = -0.049$, $SE = 0.019$, $t = -2.572$, $p = .01$), and for DO targets, significant priming occurred in the spillover region ($b = -0.044$, $SE = 0.015$, $t = -2.989$, $p = .003$). The results of Exp.2 showed that no priming occurred when prime and target used unrelated verbs. Our findings suggest that bilingual syntactic information is shared at the hierarchical structure rather than surface constituent structure (given that Chinese and English RCs share the same hierarchical structure but have different constituent order), and that lexico-semantic information plays a vital role in constructing bilingual syntactic representations.

CHINESE TRANSLATIONS OF ENGLISH WORDS: A COMPARISON BETWEEN HUMAN AND CHATGPT TRANSLATIONS

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The recent development of large language models (LLM) has prompted researchers to utilize LLMs, such as ChatGPT, to create more efficient machine translation systems [1]. Although various experiments have been conducted to compare the translation quality of machine translation and ChatGPT [2,3], the extent to which ChatGPT resembles humans in translation is relatively underexplored. Drawing on a database containing human translations of 1427 English words [4], we asked ChatGPT to provide a Chinese translation 400 times for each of the English words. For both human and ChatGPT translations, we coded the most frequent translation of a word as the dominant translation and others as alternatives.

For dominant translations that were the same between humans and ChatGPT, they were more often in ChatGPT than in humans, suggesting that ChatGPT is more consistent than humans in translation. When we included word length, word frequency, and concreteness of English words, ChatGPT was less affected by these lexical variables than humans. For alternative translations, the proportion of alternatives did not differ between humans and ChatGPT, suggesting that both were equally diversified in their translations. However, lexical effects varied between humans and ChatGPT: the proportion of alternatives increased as a function of word frequency in humans but decreased in ChatGPT; Humans were more sensitive to concreteness: Less concrete words tend to have more translations for both, while humans produce more alternatives than ChatGPT for those abstract words.

The findings of the present study contribute to a more profound understanding of the differences between machine and human word translation, and the underlying mechanisms governing translation processes. Moreover, these insights will aid in the enhancement of human-like machine translation algorithms.

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VISUAL PERCEPTION AND PHYSICAL ACTION IN VALENCE WORD LEARNING

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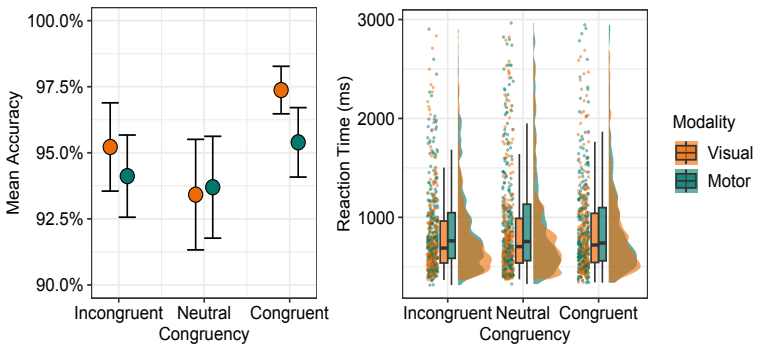
Introduction: People understand and express abstract ideas (e.g., positive/negative valence) in terms of concrete ideas (e.g., up/down) [1]. Empirical research shows that upward and downward motor actions can generate positive and negative feelings and memories [2]. Moreover, metaphor-congruent motor actions facilitate word learning [3], although no study has tested how visual perception might contribute to this effect.

Purpose: This study examines the roles of visual perception and physical actions of up and down movement in the learning of words that carry either positive or negative valence.

Materials: Stimuli were 48 pronounceable English pseudowords based on frequently used English words (e.g., *posaro*, 'potato') with: (i) 5 letters, 2 syllables; (ii) 6 letters, 2 syllables; (iii) 6 letters, 3 syllables; or (iv) 7 letters, 3 syllables. The pseudowords were assigned meanings associated with Japanese translations of positive (e.g., 'joy') and negative (e.g., 'trouble') valence words from the ANEW corpus [4]. Each participant saw a balance of positive and negative words. Stimuli were presented via digital flashcards, each with one English pseudoword on the upper part and its Japanese translation on the lower part.

Experiment: Thirty right-handed native Japanese speakers participated in six sets consisting of a study session and a test session. In the study session, participants studied eight flashcards (four positive, four negative; six seconds) three times. They were instructed to think about whether each word had a positive or negative meaning [3]. In the test session, they selected the correct translation for each pseudoword from a pair of translations, one correct and another that fit a different pseudoword in the same study session.

Conditions: Six conditions were created by manipulating two factors: Modality (Visual/Motor) and Directional Congruency (Metaphor-Congruent/Incongruent/Neutral). In the Visual conditions, during the study phase, each pseudoword automatically moved up or down (depending on Directional Congruency) to clear the screen for the next item. In the Motor conditions, participants either tapped the word (no directionality) or swiped it upward or downward to clear the screen. In the Metaphor-Congruent conditions, positive words moved upward either automatically (in the Visual condition) or by being swiped upward (in the Motor condition), while negative words automatically moved (Visual condition) or were swiped (Motor condition) downward. In contrast, in the Motor/Metaphor-Incongruent condition, the word valence and the (automatic or manual) directionality were the opposite. In the Motor/Neutral condition, the participants tapped the screen to proceed.



Results: LME, with random intercepts for participants and items, yielded two main results: (1) Significantly higher accuracy in the Congruent (96.1%) than in the Neutral (93.5%) ($p < .05$) conditions, regardless of Modality; (2) A significant main effect of Modality ($p < .05$) on reaction time, showing that pseudowords were recognized faster when learned in the Visual condition.

Discussion: This study empirically supports prior research [3] showing that directional congruency between word movement and valence improves word learning. The study also reports a new finding: the automatic movement of learning objects in accordance with valence supports learning more powerfully than participants' movements. This is inconsistent with the prior claim [3] of a privileged role for physical action in improving word learning.

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Exploring the Neurocognitive Correlates: Bilingual Profiles and Cognitive Processing in Oral Interpretation through fMRI

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Language and Cognition Lab, University of Macau

Abstract

This lecture aims to investigate the impact of bilingual profiles on interpreters' cognitive processing and their performance in oral interpreting, with a specific focus on the evidence gathered from a functional magnetic resonance imaging (fMRI) study carried out at University of Macau. It will explore the correlation between interpreters' bilingual profiles, activation of language-specific regions and executive functions regions, and their overall interpreting performance.

Bilingual profiles play a crucial role in the interpretation process, as they encompass the linguistic skills and cognitive abilities that enable interpreters to bridge the gap between languages. By analyzing the fMRI data, we can gain valuable insights into the neural mechanisms underlying interpreters' performance and understand how their bilingual profiles influence these processes. The discussions will specifically delve into the activation of executive functions, including planning, attention shifting, working memory, and inhibitory control, during the interpretation process.

Exploring the enhancement of translator's profile in cognitive processing: a process- and product-oriented comparison between translation and paraphrasing

Dechao Li
The Polytechnic University of Hong Kong

Abstract

The unique bilingual profiles of translators and interpreters have gained increasing attention in recent years. Much existing research has centered on how intensive interpreting experience may impact language processing and production. Such studies have unveiled a picture of interpreters displaying stronger connections in language representation, increased efficiency in language processing, and better abilities in cognitive control (Dong, 2023), all of which are considered integral components of the interpreter's profile. However, written translation, another unique type of bilingual experience, has been relegated to the periphery of scholarly focus. Empirical studies comparing the cognitive control abilities of translators and general bilinguals have been scarce, yielding inconclusive findings. This ambiguity could be attributable to the challenge of differentiating translator-specific advantage from the broader bilingual advantage on general cognitive tasks (Babcock et al., 2017).

Therefore, the current study made an attempt to explore the potential translator advantage with a focus on the enhancement of the translator's cognitive processing abilities in specific language mediation tasks, by comparing translators of varying expertise levels in inter-lingual translation and intra-lingual paraphrasing. The fundamental distinction between translation and paraphrasing lies in the necessity for frequent cross-language switching. As such, comparing these two tasks allows us to discern specific cognitive demands involved in translation that exceed those required by general monolingual communication tasks. Moreover, we employ a comparative analysis among translators with different expertise levels as an alternative way to investigate how intensive experience of translation practice can change the cognitive processing of language tasks. Our study included 20 translation trainees and 10 professionals who performed English-Chinese and Chinese-English translations, as well as English and Chinese paraphrasing. Eye-tracking and linguistic complexity analysis were used to reveal the cognitive processing in these four tasks. The results will be discussed in the sharing. This study represents an initial exploration to identify the cognitive demands unique to translation compared to paraphrasing, and how translation experience contributes to the strengthening of cognitive abilities associated with these demands, thereby shaping the translation profile. Our efforts aim to deepen the understanding of the distinctive bilingual profiles of translators and provide valuable insights for translation training.

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Neurocognitive signatures of translation directionality

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Abstract

In the last decades, numerous neuroscientific investigations have revealed various aspects of translation processes, including differences between forward translation (FT, from L1 into L2) and backward translation (BT, from L2 into L1). In this talk I will review some key findings on the topic, incorporating insights from neuropsychological, hemodynamic, and electrophysiological techniques. The evidence convergently demonstrates that FT is more cognitively demanding than BT, with diverse neurocognitive patterns pointing to the role of semantic and executive mechanisms in this asymmetry. Overall, these findings allow characterizing a distinct trait of bilingual semantic memory skills while bridging the gap between translation theory and cognitive neuroscience.

How does Working Memory Function in the Development of the Complex Language Skill of Interpreting?

Yanping Dong
School of International Studies, Zhejiang University, China

Abstract

Working memory (WM) is critical to interpreting performance, but it remains unclear how WM functions in the development of the interpreting skill, and research on this question has implications for studies on the language-cognition interaction, and on the development of a general language skill. The Attentional Control Model (Dong & Li, 2020) illustrates that, to ensure the two distinctive requirements of language control and processing control in interpreting, WM (as part of cognition control for interpreting) first ensures the normal functioning of focused attention and distributed attention, which then respectively interacts with what are required for language processing in interpreting (i.e., establishment of interpreting task schema; language processing efficiency). To further explore this issue about the functioning of WM, Yu and Dong (2022) conducted a series of testing for a large group of students at the beginning and end of a year's interpreting training, and found that for both interpreting directions, although WM correlates with interpreting performance at the beginning stage, a valid structural equation model can be established only for the latter stage (end of the training year). In this model, WM impacts on interpreting performance via language competence, indicating the underlying role of WM. Further studies are being conducted with more factors (e.g., psychological and cognitive control) involved, so as to depict the trajectory of how psychological and cognitive control factors impacts on the development of the complex language skill of interpreting.

On the weak explanatory power of belief reasoning in language processing: Now what?

Dale Barr
University of Glasgow, UK

Abstract
Psycholinguists have expended considerable effort investigating how people adapt comprehension and production processes to the informational needs of their particular interlocutors, with lively debates emerging over the extent to which observed adaptations reflect the use of "common ground" or simpler heuristics. But it seems increasingly likely that partner-specific effects will explain only a tiny share of the variance in pragmatic effects which, by and large, seem to be driven by partner-independent representations and processes. Explaining pragmatic phenomena through the lens of partner independence is a seemingly important but utterly neglected agenda. In this talk I will present psycholinguistic evidence that justifies this agenda, along with some preliminary ideas about the way forward.

About the Speaker

Dale Barr is a Senior Lecturer in the School of Psychology and Neuroscience at the University of Glasgow (Glasgow, UK). He received a PhD in Psychology from the University of Chicago (Chicago, USA) in 1999. His main areas of interest are psycholinguistics, statistical modelling, and cognitive science. Most of his work consists of empirical investigations into the cognitive representations and processes underlying spoken dialogue. He has published work on various topics, including pragmatics, perspective-taking, lexical processing, cultural evolution, speech rhythm, disfluency, and multimodal signaling. His recent work investigates how language users integrate linguistic and situational information (such as interlocutors' beliefs and goals) within the constraints of real-time dialogue. His research uses a variety of methodologies, from visual-world eyetracking, EEG, and MEG, to computational modeling and Monte Carlo simulation. He has also contributed to statistical methodology, developing techniques for time-series analysis of visual-world eyetracking data, as well as for linear mixed-effects modeling. He is a founding member of the PsyTeachR teaching team at the University of

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Day 2 Stage Presentations

December 2, 2023

The Mind Hidden in Our Hands

Susan Goldin-Meadow
University of Pennsylvania

Abstract

Our hands are always with us and are used for communication all over the world. When children do not have an established language model to learn from, they use their hands to communicate—they gesture—and these gestures take on the forms of language. In this role, the hands reveal the fundamental properties of mind that give shape to language. When children do learn an established language, they again use their hands to gesture. These gestures do not look like language, but form an integrated system with language. In this role, the hands can convey ideas not found in the language they accompany. In both contexts, gesture provides a clear view of the mind hidden in our hands.

About the speaker

Susan Goldin-Meadow studied at Smith College, where she earned a B.A. in 1971, and at the University of Pennsylvania, where she earned a Ph.D in 1975 under the direction of Professors Rochel Gelman and Lila Gleitman. In 1969-1970, she spent a year at the Institut des Sciences de l'Education in Geneva, Switzerland, where she studied with Professors Barbel Inhelder and Hermine Sinclair. She has been at the University of Chicago since 1976 and is currently the Bearsdley Ruml Distinguished Service Professor in the Departments of Psychology and Comparative Human Development. Her research focuses on the homesign gesture systems deaf children create when not exposed to language, and on the spontaneous gestures that hearing speakers produce when they talk and the role those gestures play in reflecting and shaping thought. She is an elected fellow of the American Academy of Arts and Sciences and the National Academy of Sciences, has just published a book Thinking with Your Hands.

INFERENCES IN ISOLATION: AN EEG STUDY OF DISCOURSE CONNECTIVES.

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Discourse connectives (DCs), such as *but* and *so*, conjoin two elements of discourse while providing information on the nature of their conjunction. While prior experimental studies have reported a) fast integration of DCs in context-rich environments that affects; b) processing downstream from the connective [1–4], no studies have, to our knowledge, isolated the role of DCs in discourse processing in stark repeatable abstract contexts. The current work does precisely this while testing the idea that DCs a) convey procedural meaning [5] that b) facilitates processing downstream. In line with Relevance Theory, we hypothesize that this procedural meaning is cognitively costly but that it is offset by providing the addressee with positive cognitive effects.

In a paper coming from our lab [in preparation], we used reaction times to compare the cost of processing the extra-logical import of two DCs *but* and *so* (which prompt *contrast* and *causality*, respectively) to the truth-functional *and*, which we presume does not prompt additional procedures. In order to test whether there is a quantifiable inferential effort that can be isolated when processing DCs, we created a (word game) paradigm that allows the DC to be a unique source of inference in test sentences. Two variations of the same experiment provided highly similar results. In one of them, 80 participants saw 108 sentences presented in two segments as in followed by a three-letter word (1) ; they were then asked to press a button to judge whether the word corresponded to the sentence they had read. The factors manipulated were connective type (*and, but, so*) and polarity of the second segment (positive [1a.] or negative [1b.]). The results supported our pre-registered predictions by revealing that 1) *but* and *so* were processed significantly more slowly than *and* and that 2) the presence of *but* facilitates the processing of the contrasting negation in the second segment. This is consistent with previous findings [1-4].

The work that we are currently carrying out extends the same paradigm to an EEG experiment. Participants are presented with 216 sentences as in (1). A fixation cross is displayed between each sentence segment and the connective is presented in isolation. We predict that *but* and *so* will prompt more frontal positivity (P3a at around 300ms after the input followed potentially by positive slow waves) than a mere *and*, which we view as evidence that the participant is recognizing relevance for further processing [6]. As seen in Figure 1, preliminary results from 5 participants point to this outcome. Together, our studies provide insight into the inferential profile of DCs and more generally they provide evidence for an account that claims that extra cognitive effort (in the form of a procedure) is compensated by positive processing effects.

1) a.	There is a B but	there is a T.	BET
	There is a B and		
	There is a B so		
b.	There is a B but	there is no T.	
	There is a B and		
	There is a B so		

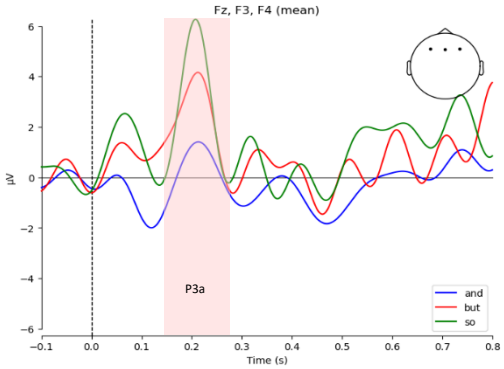

Figure 1 : ERP effect at the discourse connective for 'and' (blue), 'but' (red) and 'so' (green) on the selection of representative frontal electrodes (F3, Fz and F4) as in [2].

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EVALUATING BAYESIAN MODELS OF PRONOUN INTERPRETATION WITH MANDARIN STORY CONTINUATION DATA

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The Bayesian account of pronoun interpretation posits two determinants for pronoun interpretation biases [1][2]: (a) *P*(pronoun|referent), the probability that people use a pronoun to refer to an entity, and (b) *P*(referent), the probability that an entity will be mentioned again. This account comes with two competing models: the Expectancy Model where pronoun interpretation is affected only by *P*(referent), and the Mirror Model where pronoun interpretation is affected only by *P*(pronoun|referent) [1]. In a strong version of Bayesian Models [3], factors conditioning *P*(referent) are prescribed as primarily semantic and pragmatic, and factors conditioning *P*(pronoun|referent) are grammatical and/or information structural. But this assertion is odd, since information structure is (at least partly) a pragmatic phenomenon [4]. To evaluate different models of pronoun interpretation, we conducted two Mandarin story continuation experiments, examining how the two information structure roles, specifically Topic and Focus, affect pronoun production and interpretation.

We created 24 sets of stories with rich contextualisation, each totalling 6 clauses (see ex.(1) in English translations). Two referents, NP1 and NP2, were introduced in succession into each story. We manipulated the information status of NP1 by placing it before (Topic) or after (nonTopic) the conjunction 'if', and that of NP2 by asking a question (Focus) or adding a statement (nonFocus) before NP2. **EXP 1** (N=40) was free-prompt: participants could freely choose referring expressions for either NP1 or NP2. Hence, we could compute production probabilities. **EXP 2** (N=40) was pronoun-prompted: participants already interpreted the given pronoun, thus their continuation reflected interpretation biases.

We built generalised linear mixed effect models on *P*(referent) for both experiments, and on *P*(pronoun|referent) for EXP 1. Both experiments yielded more references to NP1 when it was topicalized than not (EXP 1: *ß* = 0.60, *SE* = 0.26, *t* = 2.33; EXP 2: *ß* = 0.66, *SE* = 0.22, *t* = 2.98). EXP 2 also showed more references to NP2 when it was focused than not (*ß* = -0.57, *SE* = 0.22, *t* = -2.57). No interaction was found in either experiment. Clearly, topicalization can affect *P*(referent), contrary to previous findings [5]. This discrepancy may be attributed to our rich story context, which is reportedly crucial for effects of predictability on pronoun use [6].

Of the three models, Bayesian makes the best prediction on the pronoun interpretation bias (R^2 of model prediction and observed data: Bayesian: 0.40, Expectancy: 0.31, Mirror: 0.16). Note that EXP 1 showed no effect of either topic or focus on *P*(pronoun|referent), which corresponds to the part of Bayesian Model that differs the Expectancy Model. Yet the Bayesian Model outperforms the Expectancy Model, suggesting that the reportedly lack of interaction between *P*(referent) and *P*(pronoun|referent) [5] does not necessarily imply their disassociation, but an information structural factor (topicality) might affect both probabilities.

Taken together, our Mandarin story continuation data demonstrated effects of Topic and Focus on pronoun resolution and the effect of topic on the *P*(referent). Our model comparison results stand against the strong version of the Bayesian Model where information structure only affects *P*(pronoun|referent), but support a weak form of the Bayesian account such that pronoun interpretation and production follow Bayesian principles [1].

(1) Lead-in clause (Clause 1): "*Comptroller Lin-Xue (NP1) went to an insurance company to audit at noon*."
Focus Manipulation (Clause 2-4):
Focus: "*Who catered reception?"*
"Assistant Zhang-Chao (NP2, Focus) catered reception, he is familiar with the processes."
Non-focus: "*The accounting work should be finished by next Monday."*
"Assistant Zhang-Chao (NP2, nonFocus) catered reception, he is familiar with the processes."
Topic Manipulation (Clause 5):
Topic: "Lin-Xue (topic), if noticed the gaps and omissions of accounting items,"
Non-topic: "If Lin-Xue (non-topic) noticed the gaps and omissions of accounting items,"
Final to-be-completed clause (Clause 6): "then _____. (**EXP 1**)" or "then *ta* ('he'/'she') _____. (**EXP 2**)"

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PROCESSING LINGUISTIC FOCUS IN DISCOURSE: EYE MOVEMENTS IN READING MANDARIN CHINESE

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While linguistic focus is known to play a crucial role in communication and representation of information [3], its exact function during language processing remains unsettled. Linguistic focus has been reported to be read longer, reflecting deeper and costlier processing, whereas it also has been shown to be read quicker, suggesting that it eases processing (reviewed in [1,4]). Reconciliation of this inconsistency is limited as most previous works have mainly compared two focus categories and other linguistic factors might confound the results [4].

To address this issue, we compared effects of a range of focus types in Chinese (Mandarin) discourse comprehension, using the eye-tracking technique. We adopted a three-sentence passage in four conditions. As in Table 1, the same target sentence (S3) was used across conditions while the preceding discourse (S2) was varied to set up the information status of the target word (**心辰 Xinchen** in S3): (i) **Contrastive Focus** (encoding corrective/contrastive information), (ii) **Information Focus** (encoding new information), (iii) **Defocus** (repeating given information) and (iv) **Wide Focus** (giving new information) ((i) and (ii) the informative part of a sentence, (iii) uninformative, and (iv) neutrally informative). Forty-eight sets of such passages were constructed and arranged in a Latin Square design, along with 110 fillers. Eye-tracking data collected from 41 native speakers during silent reading were analyzed.

The results (Table 2) showed that while narrowly focused items (information and contrastive), as compared to a defocused or a widely focused item, were read longer in early processing (i.e., first-fixation duration and first-pass duration), information focus was read faster whereas contrastive focus was read slower in later processing (i.e., rereading and regression). We interpret this reversed pattern by suggesting that information focus attracts extra attention [1, 2] which facilitates later meaning integration [5]. Meanwhile, contrastive focus requires additional processing in revising an existent discourse representation [1].

Our results suggest that the processing of linguistic focus may involve an early processing in which focused items tend to attract more attention than nonfocused items and a later meaning integrative processing related to mental model updating. We discuss this hypothetical model of focus processing as a framework to reconcile previous inconsistencies.

Table 1. Example experimental passages. Texts were displayed in 24-point regular SimSun.

S1	背景：心辰，伟丽，爱婧一起学乒乓球，要配对练习。 *Background: Xinchen, Weili and Aijing were in the same Ping-Pong class, and they were required to pair up for practicing.*	
S2	Condition of Contrastive Focus	Condition of Information Focus
	甲：爱婧挑了伟丽？*A: Aijing picked Weili?*	甲：爱婧挑了谁？*A: Who did Aijing pick?*
	Condition of Defocus	Condition of Wide Focus
	甲：谁挑了心辰？*A: Who picked Xinchen?*	甲：发生了什么事？*A: What happened?*
S3	乙：爱婧挑了**心辰**，但是乒乓教练没有同意。 *B: Aijing picked **Xinchen**, but the coach disapproved.*	

Table 2. Means (SEs) of eye-tracking measurements for the target word region

Condition	1st fixation duration	1st pass duration	Rereading	Reg. out	Total time
ContrFoc	236(5.6)	275(7.8)	426(37.2)	0.33(0.02)	490(18.9)
InfoFoc	236(5.3)	278(7.8)	251(27.4)	0.21(0.02)	412(18.2)
DeFoc	211(4.5)	226(5.9)	374(48.8)	0.21(0.03)	317(14.0)
WdFoc	222(4.6)	245(6.0)	402(31.8)	0.33(0.02)	429(18.3)

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LOCALITY BIAS IN PROCESSING CHINESE REFLEXIVES *ZIJI* AND *TA-ZIJI*: EVIDENCE FROM SELF-PACED READING

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Existing work has shown that processing Chinese reflexives is subject to locality bias (i.e., local antecedents are accessed more rapidly than long-distance antecedents), suggesting that local search may be a default parsing strategy in antecedent retrieval [1]. Few studies, however, have directly compared locality biases between *ziji* and *ta-ziji*, and results are mixed [2-5]. In particular, when occurring in the subject position of an object-modifying relative clause (RC), *ta-ziji*, but not *ziji*, was found to show anti-locality bias [2&3]. Such evidence was argued to reflect an emphatic interpretation of *ta-ziji* [2], hinting that reflexives in different positions (subject vs. object) may vary in their sensitivity to the locality constraint [3]. We note that these results are likely to be confounded by the semantic bias of the embedded verb and the number feature of candidate antecedents. Thus, the current study aimed to, with proper control of potential confounding factors, revisit the questions of (i) whether Chinese comprehenders show anti-locality bias when processing reflexives in the RC-internal subject position, and (ii) whether *ziji* and *ta-ziji* exhibit distinct parsing profiles in online sentence comprehension.

Using self-paced reading (N=150), we manipulated *Reflexive Type* (*ziji* vs. *ta-ziji*) and *Binding Type* (Local binding vs. Long-distance binding), yielding four conditions (see (1)). Sixteen sets of experimental items were created, all of which contained a context, a critical clause, and a continuation. In the critical clause, each occupational noun phrase (NP) was followed by a proper name of stereotypical gender to ensure both NPs are singular. Embedded verbs were neutral verbs with an equal bias toward either antecedent selected from a norming test (N=48). Comprehension questions were targeting different parts of trial sentences. To analyze the reading times (RTs) data, we fit linear mixed models with fixed factors and log-transformed RTs of the previous region as predictors.

At the reflexive region, we observed a main effect of *Reflexive Type* (β=0.054, t=4.618, p<.001): *ta-ziji* elicited significantly longer RTs compared to *ziji*, likely due to *ta-ziji*'s multi-morphemic form and relatively low frequency. Crucially, at the head noun region, we found a main effect of *Binding Type* (β=0.058, t=3.669, p<.001): for both *ziji* and *ta-ziji*, a semantically appropriate antecedent was significantly easier to process when occurring in the local domain than when outside the local domain. These patterns contrast with [2&3], indicating that, with a rigorous experimental design, Chinese reflexives in the RC-subject position do exhibit a locality bias and that the emphatic reading of *ta-ziji* is not preferred with written stimuli. Our results further support the local search hypothesis [1] that the parser strategically restricts the initial antecedent retrieval to the local syntactic domain.

(1) Critical clause (segments indicated by slashes; context and continuation are only shown in translation):

…, lingban/Jiang Gang/ cheng/ [zhuchu/ Fengge/ bumanyi/[$_{RC}$*(ta-)ziji/ jinwan/ jianzhi]de/ niupai],…* **(Local binding)**

…, zhuchu/ Fengge/ [lingban/ Jiang Gang],… **(LD binding)**

'After the restaurant closed, / waiter/ Jiang Gang/ said/ [chef/ Brother Feng/ was not satisfied with/ [RC the steak/ that *(ta-)ziji*/ pan-fried/ tonight]]/ because the customers' reviews were mixed.'

References: [1] Dillon et al. 2014. *Frontiers*. [2] Wang. 2017a. *Journal of Psychological Science*. [3] Wang. 2017b. *Journal of SJTU*. [4] Lyu et al. 2022. *Chinese Teaching in the World*. [5] Dillon et al. 2016. *Frontiers*.

THE INFLUENCE OF TOPICALITY ON INTERPRETATION OF NULL AND OVERT PRONOUNS IN MANDARIN

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Previous research suggests that pronoun interpretation is related to topicality. Theories like the accessibility hierarchy (Ariel, 2001) suggest that topical entities tend to be referred to with reduced forms like pronouns.This claim is supported by experimental evidence, for example, Foraker (2004) found that pronouns were resolved faster when they referred to topical entities.

However, it is not clear how topicality affects interpretation of different types of referring expressions. Through left-dislocation structure, Lam and Hwang (2022) found that topicality promoted the use of only null pronouns but not overt pronouns. Yet no agreement has been reached on how topicality affects interpretation of null and overt pronouns in languages with both pronouns. On one hand, Ueno & Kehler (2016) found that only overt pronouns are sensitive to topicality in Japanese. On the other hand, Ngo (2019) found that only null pronouns showed sensitivity to topicality in Vietnamese. But Kim et al. (2013) did not find any evidence that null and overt pronoun interpretation are sensitive to topicality in Korean.

To clarify mixed findings in the literature, the current study investigated how topicality influenced the interpretation of null and overt pronouns in Mandarin. Mandarin provides a good testing ground for studying the influence of topicality on null and overt pronouns for several reasons. First, unlike in Japanese and Korean, both null and overt pronouns in Mandarin are commonly used. Second, unlike in Vietnamese, overt pronouns in Mandarin are function words and are not used for other meanings (i.e., kinship relations).

We manipulated topicality using a left-dislocation structure in (1).

(1) a. non-topical: b. topical

因为小明打了小李，所以... 小明因为打了小李，所以...

‘Because Xiaoming beat Xiaoli, so…’ ‘Xiaoming because beat Xiaoli, so..’

When the subject is fronted as in (1b), it is considered more topical. To see how topicality affects the interpretation of overt and null pronouns, non-topical and topical prompts were followed by either 就 “ø then” or 他就 “he/she then” The adverb 就 ‘then’ always occurs following the subject and before a predicate. When no explicit pronouns are present before 就, it signals the presence of a null pronoun.

Using Latin Square design, we constructed four lists. Participants (N= 58) were randomly assigned to one of the four lists. They were asked to provide natural continuations to prompt sentences. We analyzed subject and object reference as a function of topicality and pronoun prompt using mixed-effect binomial logistic regression models. We found significant effects of topicality and prompt type. Topicality increased subject reference in topical condition (89.5%) compared to the non-topical condition (75.7%) (p<.001). Null pronouns were more subject-biased than overt pronouns (86.5% vs 71.7%) (p<.001). There was no interaction between topicality and pronoun types. These results suggest that both null and overt pronouns are more likely to refer to the subject in the topical condition than non-topical condition, and null pronouns have a stronger preference for subject antecedents.

THE DISSOCIABLE TWO-STAGE PROCESSING OF IRONIC CRITICISM AND IRONIC COMPLIMENT

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Irony expresses an intended meaning using words with opposite meaning to what is intended. Depending on the valence of the intended meaning, irony can be distinguished into two types: ironic criticism, which expresses a negative intended meaning by positive literal words, and ironic compliment, which expresses a positive intended meaning using negative literal words. Previous ERP studies observed that, compared to literal sentences, ironic criticisms induced larger a P200 at an earlier stage of processing and a larger P600 in the late stage of pragmatic inference. However, little research has been done to examine the processing of ironic compliment.

To examine potential difference between the processing of the two types of ironies, we asked participants (20 males, 20 female) to read scripts, each consisted of a context regarding a speaker and an addressee and a target sentence said by the speaker. Depending on the type of the target sentence, each script corresponds to one of four conditions: ironic criticism and ironic criticism control, and ironic compliment and ironic compliment control. The control sentences were the same as the corresponding experimental sentences but expressed literal meanings. Participants answered comprehension questions after reading one-third of the scripts and rated the degrees of humor and sarcasm of the target sentences after the EEG experiment.

The ERP results showed that, at the critical words in the target sentences, ironic compliment induced a larger P200 relative to its control; this effect was absent for ironic criticism. Both types of ironies induced a larger P600 relative to literal controls but with distinctive topographic distributions. The P600 effect for ironic compliment was posteriorly distributed at both hemispheres, while the effect for ironic criticism was centrally distributed. Decoding analysis confirmed the differential ERP effects for the two types of ironies by showing the above chance accuracies of discriminating ironic criticism from ironic compliment in both the P200 and P600 time windows. Moreover, the P600 effect for ironic criticism was correlated with the rating of sarcasm. These findings convergently demonstrated that the processing of ironic criticism and ironic compliment is differentiated in both the early stage, in which the discrepancy between the context and literal sentential meaning is firstly detected, and the late stage, in which the speaker's intended meaning is recovered.

***Key words*:** irony, criticism, compliment, conflict detection, pragmatic inference

Why do speakers use syntactically non-basic sentences?
Evidence from pupillometry and functional near-infrared spectroscopy

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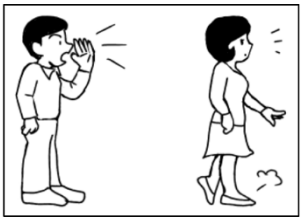
Natural languages have parametric variations in how they order subject (S), object (O), and verb (V) in a sentence: SVO in English and SOV in Japanese. In addition to syntactically basic word orders, many languages with flexible word orders allow non-basic word orders. In Japanese, SOV is syntactically basic, but O can move over S to form OSV. It has been well established in the psycholinguistic literature that basic word order has a processing advantage over other possible derived word orders in sentence comprehension. This raises the question of why speakers use non-basic word orders with syntactically more complex structures.

One possibility is that the non-basic sentences are used because they are more efficient for the speaker to produce. That is, speakers choose a structure that is easy to produce even though it may be difficult or unhelpful for listeners to understand. Ferreira and Yoshita (2003) showed that when native Japanese speakers were asked to recall a ditransitive sentence that originally had a new-given order, they produced the sentence in the given-new order by fronting a discourse-given argument over a discourse-new argument. Although these are offline production data, they suggest that non-basic word orders require less cognitive effort to speak when they allow speakers to place a discourse-given referent earlier than a discourse-new referent. We call this possibility the Speaker Economy Hypothesis.

Alternatively, it is possible that speakers produce them to help listeners understand sentences more efficiently, since listeners usually have no control over the input speed and inevitably have to recover a syntactic structure from a string of words at speech rate. In sentence comprehension, non-basic word orders have been found to be easier to process when the displaced constituent (e.g. O in Japanese) refers to discourse-given information compared to when it refers to discourse-new information. Thus, the use of non-basic word orders is motivated by listeners' efficient language processing. We refer to this possibility as the Listener Economy Hypothesis.

To test these hypotheses, we conducted a production experiment, in which participants (n = 20) described a picture while cognitive load was measured using functional near-infrared spectroscopy (fNIRS) and pupillometry. fNIRS is a non-invasive brain imaging technique that measures changes in the amount of regional oxyhaemoglobin in the brain, while pupillometry is an eye-tracking technique that measures the size of the pupil, which changes as a function of the cognitive load associated with sentence production. In the experiment, the participants were presented with a picture of a person and asked to describe it (e.g. 'There is a man/woman.'). They were then asked to describe a transitive event in SOV or OSV (e.g. 'The/a man called the/a woman.'). The first sentence '*There is a man/ woman'* made an S or O of the second target sentence discourse-given. Thus, we manipulated Word Order (SOV/OSV) and Context, creating four conditions: S-O$_{GIVEN}$-V, S$_{GIVEN}$-O-V, O-S$_{GIVEN}$-V, and O$_{GIVEN}$-S-V (20 trials for each condition). The Speaker Economy Hypothesis predicts that the production of OSV should be facilitated when O refers to discourse-given information whereas OSV should be difficult for speakers to produce regardless of the givenness of O according to the Listener Economy Hypothesis.

Pupillometry showed that a supportive context reduced the cost of producing OSV (i.e. O$_{GIVEN}$-S-V). Consistent with this observation, the activation of the left inferior frontal gyrus decreased during the production of OSV when O referred to discourse-given information (vs. when it did not). An analysis of the speech onset latency showed that native Japanese speakers were faster to initiate their speech with O$_{GIVEN}$-S-V than with O-S$_{GIVEN}$-V, suggesting an advantage for the given-new order. We argue that these results are more consistent with the Speaker Economy Hypothesis.



Target sentences:

(a) SOV:	dansei-ga	josei-o	yobimasita.
	man-NOM	woman-ACC	called
	'The/a man called the/a woman.'		
(b) OSV:	josei-o	dansei-ga	yobimasita.
	woman-ACC	man-NOM	called

CONTRIBUTIONS OF INTERPRETING TRAINING TO BILINGUALS' ATTENTIONAL NETWORKS AND THEIR DYNAMICS

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Interpreting, a complicated and demanding bilingual task, depends heavily on attentional control. Interpreters' limited attention is severely saturated and taxed at the listening, reformulation, and production phases to successfully fulfill this task. However, few studies have focused on the interpreters' advantages in attention, and the findings so far have been inconsistent. Meanwhile, the connection between attentional networks and other cognitive abilities, such as working memory (WM), has rarely been explored in interpreters.

The present study investigated whether interpreting experience (IE) contributed to the attentional networks of bilinguals and explored the link between interpreters' attention and WM. To this end, we recruited three groups of late Chinese-English bilinguals with different amounts of interpreting training experience: the More-IE group, the Less-IE group, and the No-IE group. The More-IE group and the Less-IE group were second-year postgraduate students majoring in English interpreting and translation, with the former having completed a greater number of interpreting courses and after-class practice during their first year of postgraduate study. The No-IE group was a control group comprising second-year postgraduate students majoring in English literature. The three groups were matched in their L2 experiences, as measured by the Language History Questionnaire (LHQ 3.0) and the Oxford Quick Placement Test, except for their interpreting training experiences.

We performed the Attention Network Test (ANT) and the Automated Operation Span Task to probe into participants' three attentional networks (the alerting, orienting and executive networks) and working memory capacity (WMC). Results showed that only the alerting network was more efficient in the More-IE group than in the Less-IE and No-IE groups. Moreover, the dynamics between the alerting and executive networks were was significant only in the More-IE group. Specifically, the More-IE group exhibited a larger executive effect in the presence of an alerting cue. Furthermore, we found a negative correlation between the executive effect and WMC in the More-IE group. Our study provided empirical support for the Attentional Control Model (Dong and Li 2020), stimulating further research into the role of attentional control in interpreting.

MODELLING INTERLOCUTOR LINGUISTIC COMPETENCE IN LINGUISTIC UPDATING

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People constantly update the label they use to refer to an object based on their recent linguistic experience [1,2]. For instance, speakers have an increased tendency to repeat a particular referential expression (e.g., *bus* instead of *coach*) if their interlocutor has previously used that expression. Similarly, listeners identify referents more quickly when their interlocutor repeatedly uses a particular expression. By updating form-meaning associations, listeners can increase the ease of comprehension for interlocutors. In this study, we ask whether such updating is sensitive to the linguistic competence of the interlocutor. If linguistic updating facilitates communicative success, we should expect more updating by comprehenders if their interlocutor is linguistically less competent [3]. Specifically, we examined whether comprehenders update form-meaning associations to a greater extent when comprehending a less competent interlocutor (a child) than when comprehending a more competent one (an adult). To test this hypothesis, we first primed participants with a semantic relatedness judgement task and then tested them with a visual world eye-tracking experiment.

The experiment consisted of a priming phase and a testing phase. In the priming phase, forty-eight Mandarin-speaking participants listened to sentences spoken by either an adult or a child Mandarin speaker. A sentence had either a preferred name (e.g., *xi$_1$hong$_2$shi$_4$*, “tomato”; tomatoes are ripe in summer) or a dispreferred name (e.g., *fan$_1$qie$_2$*, “tomato”) of an object. Participants then decided whether a probe was semantically related to the sentence. In the testing phase, participants looked at a visual scene consisting of three objects: a target (e.g., *fan$_1$chuan$_2$*, “sailing boat”), a competitor whose dispreferred name (appeared in the priming phase) shared phonological onset with the name of the target (e.g., *fan$_1$qie$_2$*, “tomato”), and a distractor. They then heard a spoken word (e.g., *fan$_1$chuan$_2$*, “sailing boat”) and clicked on the mentioned object. If participants update their form-meaning associations based on prior input, there should be a strengthened link between *fan$_1$qie$_2$* and the concept of tomato when they heard *fan$_1$qie$_2$* (instead of *xi$_1$hong$_2$shi$_4$*) in the priming phase. Crucially, if linguistic updating is modulated by the linguistic competence of the interlocutor, then the effect is expected to be larger when the interlocutor is a child than when it is an adult.

We used growth curve analyses to capture changes in fixation proportions on the competitor starting from the spoken word onset to the end of the first character (e.g., *fan$_1$* in *fan$_1$chuan$_2$*). A logistic mixed-effect model revealed a significant interaction of condition and interlocutor, indicating that the overall fixation proportion difference between the primed and unprimed conditions was larger in the child than in the adult interlocutor condition. Sperate analyses showed that when hearing a child, listeners tended to fixate more on the competitor in the primed (i.e., hearing *fan$_1$qie$_2$* in the priming phase) than in the unprimed condition; however, no such difference was found when hearing an adult. Our results suggest that listeners update their form-meaning associations to a greater extent when the interlocutor was linguistically less competent, presumably because this helps boost communicative success.

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DOMAIN GENERAL COGNITIVE CONTROL BRAIN NETWORKS ARE ASSOCIATED WITH THE DEVELOPMENT OF CHILDREN'S LANGUAGE ABILITIES

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The processing of language is a crucial aspect of complex cognitive functioning in humans. In research on adults, it has been found that this process is mainly supported by a left-lateralized language specific network, distributed across frontal and temporal lobes, with less dependence on brain networks related to domain-general cognitive control (Diachek, Blank, Siegelman, Affourtit, & Fedorenko, 2020). However, could this finding be applicable to children and adolescents? As they may have inferior language skills compared to adults, could they be more reliant on domain-general brain networks? To address this question, in this study, we investigated the developmental patterns and associations between cortical morphology and language abilities in childhood and adolescence.

We used data from 236 subjects（age= 6-18）in the Chinese Color Nest Project (Liu et al., 2021) . To assess language ability, we used the verbal processing scores derived from two subtests, namely vocabulary and comprehension, extracted from the Chinese version of the Wechsler Intelligence Scale for Children, Full Scale, Fourth Edition. Gray matter volumes of the language network and the domain-general cognitive control network (defined as the combination of the fronto-parietal network and dorsal attention network) were used as indicators of brain morphology. The language network was further divided into left and right hemispheric to investigate hemispheric differences.

Results have emerged as follows: (1) In childhood and adolescence, the development of language skills shows significant association with the left hemisphere of the language network. However, for the right hemisphere of the language network, significant correlation with language ability was only observed during adolescence. Additionally, domain-general cognitive control network demonstrated a relationship with language abilities in both childhood and adolescence. These results suggest a swtich of reliance on the left portion of the language network to both the left and right portion of the language network from childhood to adolescence. Additionally, our results also indicate that both the language network and the domain-general cognitive control network work in conjunction to facilitate the development of language ability.

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Low-frequency Neural Activity Tracks Semantic Properties of Mandarin Words

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How human brain integrates lower levels of linguistic units (e.g. syllables, words) into higher level units (e.g. phrases, sentences) has become a focal point in neural oscillation studies. One spectrum of existing studies argues that our brain combines words into phrases and sentences by solely relying on the semantic information of words without recourse to the hierarchical syntactic information, whereas the other spectrum claims that neural activity tracks syntactic information instead of semantic properties of words. The current study addressed this debate by conducting a speech perception experiment using the frequency-tagging paradigm. We were interested to see whether cortical activity tracks semantic or syntactic information. Two types of sequences, antonym pairs and subject-predicate structure, were constructed, containing synthesized continuous isochronous disyllabic Mandarin words (see Table 1), with each sequence consisting of 24 disyllabic words and each word lasting for 500ms. Antonym pairs contained words with semantic association only; and subject-predicate structure contained words with syntactic association only. Participants (N=42, $Mean_{age}$= 23;3, 27 girls) were asked to listen to these different types of sequences while their neural activity was recorded by EEG. We observed a significant 2Hz peak in both conditions (see Figs. 1 and 2), meaning that neural activity tracks every single word information; and a significant 1Hz peak was observed in the antonym pairs, but not in the subject-predicate structure, suggesting that our brain cannot integrate words into phrases relying solely on syntactic information. In addition, we constructed a perplexity model to simulate how the semantic properties of words contribute to the neural responses to the sequences. Again, we found a significant 2Hz peak in both conditions (see Figs. 3 and 4); and a significant 1Hz peak was observed in the antonym pairs, but not in the subject-predicate structure, consistent with the EEG results. Implications of the findings were discussed.

Table 1. Experimental conditions

Condition	Speech Sequence
Antonym pairs	$N_1N_2N_1N_2N_1N_2N_1N_2$… 真话谎言赢家败者城市乡村白天夜晚…… Truth lie winner loser city country day night…
subject-predicate structure	NVNVNVNV… 大海丢失细胞讲课果汁扫地厨房生长…… Sea lost cell teach juice sweep kitchen grow…

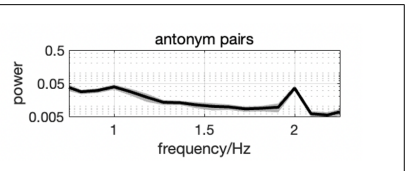


Fig. 1 Spectral peak in antonym pairs condition

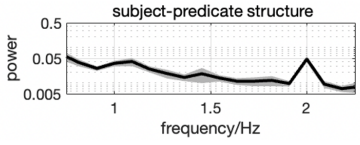


Fig. 2 Spectral peak in subject-predicate structure condition

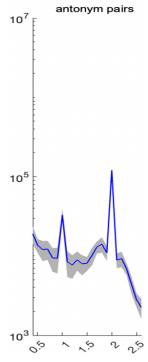


Fig. 3 Spectral peak in antonym pairs condition in the perplexity model

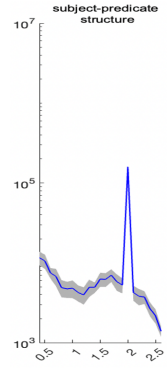


Fig.4 Spectral peak in subject-predicate condition in the perplexity model

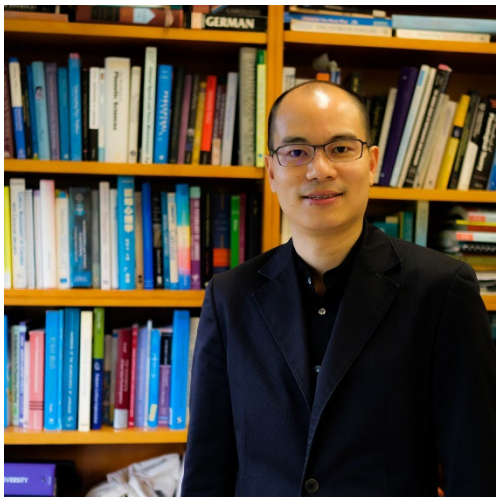
Learner-internal and -external factors in language learning

Patrick C. M. Wong
The Chinese University of Hong Kong

Abstract

Decades of research in spoken language processing has attempted to answer many questions, from those related to its basic structure and units of abstraction, psychological realization, to biological foundation. One intriguing aspect of spoken language that drives this large body of research and the accompanied theoretical advances is individual differences in learning. In this presentation, I will highlight some of the studies from my research group that examined learner-internal and -external factors that contribute to individual differences, including factors such as biological variability, instructional and input characteristics, and their interactions. I will present studies that investigated first and second language learners as well as studies of children with or are at higher likelihood of neurodevelopmental conditions. I argue that an emphasis on investigating individual differences has tremendous potential for translational linguistics that has direct implications for clinical and pedagogical practices.

About the speaker



Patrick C.M. Wong is Professor of Cognitive Neuroscience and Linguistics and Founding Director of the Brain and Mind Institute at The Chinese University of Hong Kong (CUHK). Before moving to Hong Kong, he served on the faculty of Northwestern University for close to a decade. Wong's research covers a wide range of basic and translational issues concerning the neural basis and disorders of language and music. Findings from this research have appeared in venues of general interests including *Nature Neuroscience*, *PNAS,* and *Science Advances*. In 2021, he was named a Guggenheim Fellow for Humanities. Wong's research has received public attention from media outlets such as *The New York Times* and the British Broadcasting Corporation/Public Radio International. A versatile and effective teacher, research mentor, and clinical educator, he is a three-time recipient of the Faculty Outstanding Teaching Award at CUHK. Wong actively seeks to translate his research into clinical and educational solutions. One of his patented inventions, Precision Listening®, was awarded the Gold Medal with Congratulations of the Jury at the 2023 International Exhibition of Inventions Geneva.

Day 3 Stage Presentations

December 3, 2023

Limits of information processing in language comprehension and production

Richard Futrell
University of California, Irvine

Abstract

I argue that some major properties of online language processing—both comprehension and production—can be understood in terms of fundamental limits on information processing arising from information theory. On the comprehension side, I present a computational model where an informational bottleneck on memory gives rise to dependency locality effects and detailed cross-linguistic patterns of structural forgetting. On the production side, I present a model where incremental sentence production is constrained by an information bottleneck on cognitive control. Both models lead to a view where statistical prediction, as performed by modern large language models, is a key part of the way language is comprehended and produced.

About the speaker

Richard Futrell is Associate Professor in the Department of Language Science at the University of California, Irvine. His research focuses on language processing in humans and machines, and how human language is shaped by constraints on processing.

Structural priming in ChatGPT

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Large language models (LLMs) such as ChatGPT showcase a remarkable ability to understand and generate language coherently and in an uncannily human-like manner [1]. Intriguingly, evidence suggests that ChatGPT, like humans, is susceptible to structural priming, i.e., the propensity to reuse previous syntactic structures [2]. This observation lends credence to the idea that syntactic representations might emerge organically in ChatGPT, despite it not having been trained on syntactically-annotated data.

Our open-ended, preregistered project (https://osf.io/qbuzw/) dives deeper into this phenomenon of structural priming in ChatGPT. Given that ChatGPT operates solely with text input and output, we adopted the sentence completion paradigm [3]. Here, ChatGPT was given a prime sentence or preamble to understand and complete, followed by a target sentence preamble for completion. We investigated how the prime structurally influenced the target completion. The experimental design and stimuli used were adapted from existing human-centric studies, and in each experiment, we presented one trial per run, testing each item across 1000 runs.

In **Study 1**, we examined the persistence of abstract structural priming and lexical boost by varying the distance between the prime and target (with 0, 2, or 6 fillers in between) [4]. Our findings demonstrated long-lasting abstract structural priming and a distance-sensitive lexical boost, mirroring human tendencies [4]. **Study 2** revealed that, like humans, ChatGPT exhibited no boost in priming due to tense or aspect overlap between the prime and target, but a boost was observed due to number overlap [3]. This suggests that ChatGPT's morphological effects on structural priming don't entirely mimic human behaviour. In **Study 3**, we found that ChatGPT, akin to humans, doesn't fully suppress an incorrect syntactic analysis when completing a target preamble following a prime containing temporary syntactic ambiguity [5]. In the context of plausible and implausible primes, **Study 4** showed that structural priming in ChatGPT was reduced following an implausible prime, suggesting that, like humans, ChatGPT reevaluates the syntax of implausible sentences to produce plausible meanings [6]. Finally, **Study 5** compared structural priming within and across languages [7]. Both intra and inter-lingual structural priming were observed, along with a lexical boost within languages and a smaller translation-equivalent boost across languages, in line with human results [7].

This ongoing project has thus far unveiled that ChatGPT, despite not being trained on syntactically-tagged data, demonstrates a susceptibility to structural priming that's remarkably akin to human behaviour. Our findings propose that LLMs like ChatGPT might harbour emergent syntactic knowledge that parallels human syntactic understanding [8]. This unanticipated revelation fuels our continued examination of human-like linguistic phenomena in AI language models.

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SYNTACTIC INFORMATION DRIVES LANGUAGE MODELS' ALIGNMENT WITH HUMAN COMPREHENSION PROCESSES

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Introduction With the recent success of large language models (LLMs), there has been an increasing interest in understanding whether these models process sentences similarly to humans. Prior studies have suggested a high correlation between transformer-based language models and human behavioral and neural responses during naturalistic reading or listening (e.g., Goldstein et al., 2022; Schrimpf et al., 2021). However, it remains unclear what linguistic information was incorporated by the LLMs during comprehension. In this study, we compared BERT's attention layers with human eye movement and fMRI activity patterns while native English speakers (L1) and non-native learners of English (L2) engaged in self-paced reading tasks during fMRI recording. To assess the contribution of syntactic information, we further removed syntactic dependency extracted from BERT's attention layers and conducted the correlation analysis again.

Methods We used the openly-available Reading Brain dataset (Li et al, 2022), which includes concurrent eye-tracking and fMRI blood-oxygen-level-dependent (BOLD) signals while participants read 5 short English articles. The subjects included 52 L1 speakers and 56 L2 speakers of English. For each subject, we used the eye-fixation timepoints to extract the fMRI signals within a left-lateralized language mask time-locked to each word and constructed an fMRI data matrix for each sentence. We also extracted the saccade pattern for each sentence, and we compared the fMRI and saccade patterns with the attention patterns of BERT using representational similarity analysis (RSA; Kriegeskorte et al., 2008). Following Manning et al. (2020), we extracted the dependency distances of each sentence from BERT's attention layers and we regressed them out from the attention layers. At the group level, we examined the correlation coefficients between the fMRI/saccade patterns and the attention patterns of BERT using a one-sample t-test. Statistical significance was determined by a cluster-based permutation test (Maris & Oostenveld, 2007) with a threshold of $p < 0.05$ family-wise error (FWE) correction.

Results and conclusion Our results showed a significant correlation between BERT's attention patterns and the saccade patterns of both L1 and L2 speakers, with the maximum correlation at layer 15 ($r = 0.29$, $p<.001$ for L1 and $r=0.33$, $p<.001$ for L2). However, after removing syntactic dependency from the model's attention layers, the correlation coefficients decreased substantially for both L1 and L2 speakers (e.g. at Layer 15: $r = 0.29$, $p<.001$ for L1 and $r=0.33$, $p<.001$ for L2; see Figure 1A). The fMRI results revealed a significant cluster at the left middle temporal lobe (LMTL) for both L1 and L2 speakers (see Figure 1B), yet no significant clusters were found after removing syntactic dependency from the attention layers. These results suggest that syntactic parsing plays a major role in LLMs' high alignment with human comprehension processes. Notably, the correlation coefficients between BERT's attention patterns and human eye movement patterns were significantly higher for L2 speakers than for L1 speakers, suggesting that current language models may employ comprehension strategies that differ from those of native speakers.

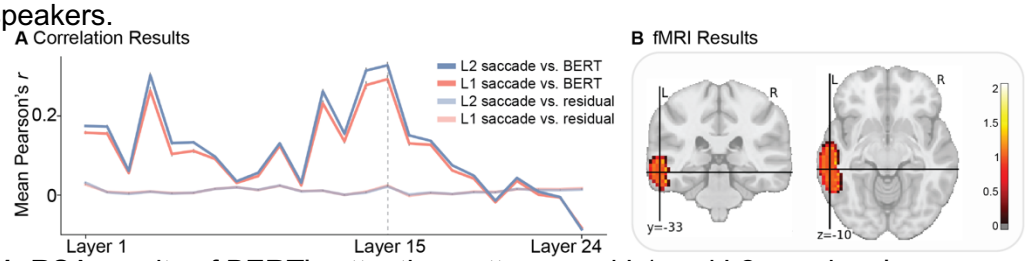

Figure 1. RSA results of BERT's attention patterns and L1 and L2 speakers' eye movement and fMRI activity patterns during naturalistic reading comprehension.

TALKER NORMALISATION OF PROSODIC CUES IN NON-NATIVE SPEAKERS

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In speech perception, the surface acoustic cues are susceptible to variability caused by social factors, as well as biological factors. Consequently, listeners must normalise the variable acoustic cues in speech perception. The process of listeners mapping variable acoustic signals onto the invariable underlying linguistic categories is called talker normalisation. Several talker normalisation models have been proposed (Chen et al., 2022; Shao & Zhang, 2019) and the current study aims to test the generalization of one of the latest talker normalisation models involving probabilistic parametric representation (PPR, Chen et al., 2022). Their model proposed that surface prosodic cues are represented as statistical distributions where the parameters of the distributions of the lexical tones are mentally stored, and this has been shown for both native Cantonese and Mandarin speakers in Cantonese lexical tone recognition (Chen et al., 2019, 2022). The mentally stored distributions may still play a role even if a tonal context is present for native Cantonese speakers. In the current study, we take tonal contexts into consideration in investigating the effect of tonal contexts and PPR on Cantonese tone recognition among Mandarin speakers.

Thirty-four Hong Kong Cantonese speakers (17 females and 17 males) were recruited and instructed to produce the target syllable /ji/ with T3 [33] embedded in two carrier sentences, i.e., /tʰiŋ tʰiŋ/ T1 [55] (“Listen to”) __ and /tsɐu hɐi/ T6 [22] (“This is just”) __. The tones of the carrier sentences were then manipulated based on the semitone distance (Table 1) between T1, T3 and T6 estimated from 68 speakers (CUSENT; Lee, n.d.). T1 [55] in /tʰiŋ tʰiŋ/ was manipulated to be 3.56 and 3.90 semitones higher than the target syllable (T3 [33]) for male and female speakers respectively; similarly, T6 [22] in /tsɐu hɐi/ was manipulated to be 3.56 and 3.90 semitones lower. Seven male and seven female native Mandarin speakers, with less than one-year formal Cantonese instruction, were recruited in the Cantonese tone recognition task where they were informed about the speaker gender in the stimuli. If the mentally stored distribution PPs play a more significant role in tone recognition, the target T3 would be identified as T3 regardless of its tonal context. On the contrary, if tonal context is more important, the target T3 would be identified as the low T6 in manipulated high T1 context and, *mutatis mutandis*, T3 would be identified as high T1 in manipulated low T6 context.

Multinomial mixed effects modelling was used to test the significance of tonal contexts and mentally stored distributions on Cantonese tone recognition among Mandarin speakers. The result shows that mentally stored distributions have a significant effect on Cantonese tone recognition in both manipulated low and high tone contexts (ps < 0.001), while only the low tone context has a significant effect ($p < 0.001$). Therefore, the findings provide insights about the accessibility of distributional information of non-native prosodic cues with the presence of contextual information.

Table 1.
Semitone distance between T1 and T3, T1 and T6 and T3 and T6 of male and female speakers from the CUSENT corpus.

Semitone distance	T1 vs. T3	T1 vs. T6	T3 vs. T6
Male	2.64	3.56	0.93
Female	3.01	3.90	0.88

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SIMILARITY-BASED INTERFERENCES IN CHINESE CLASSIFIER-NOUN DEPENDENCIES

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Introduction Similarity-based interference has greatly motivated the cue-based retrieval theory of dependency processing (e.g., Lewis & Vasishth, 2005). However, previous work has focused on morphosyntactic cues in subject-verb and anaphoric dependencies in Indo-European languages (e.g., "The key to the doors is rusty"). It remains unclear what other types of cues guide retrieval beyond these dependencies. Here we report two self-paced reading (SPR) and two A-Maze [3, 4] experiments in Mandarin Chinese (MC) investigating whether interference arises in classifier-noun dependency processing, as predicted by cue-based retrieval. In MC, a noun in certain contexts must take a classifier that matches in semantically defined features. In *topicalized existential* constructions, the classifier can appear after its dependent noun, as in "shu you wu-BEN" (book have five-CL, "*there are five books*"). At "BEN", a syntactically licensed dependent noun (i.e., target) must be retrieved from memory; during this process, other nouns held in memory (i.e., distractors) may cause interference.

Design We crossed target mis/match and distractor mis/match in a 2x2 design. **Exp1** (SPR) studies *retroactive* interference, whereby the distractor appears after the target, as in (1a). The target (in bold) is "novel/snacks", and the distractor (in italics) is in an intervening free relative. The target and the distractor either match or mismatch with BEN. The nouns "novel" and "textbook" (in green) has the [+BEN] feature while "desk" and "snack" (in red) do not. **Exp2** (A-Maze) aims to replicate Exp1. **Exp3** (SPR) studies *proactive* interference, whereby the distractor appears before the target, as in (1b), with the distractor nested in a prenominal RC. **Exp4** (A-Maze) aims to replicate Exp3. Cue-based retrieval predicts that a matching distractor can cause slowdowns at the classifier (*inhibitory* interference) in target match conditions but causes speedups in target-mismatch conditions (*facilitatory* interference).

(1) a. **xiaoshuo/dianxin** zai jiaocai/zhuozi pangbian de zuzu you san-BEN
novel/snack at *textbook/desk* around DE fully have three CL
b. jiaocai/zhuozi pangbian de **xiaoshuo/dianxin** zuzu you san-BEN
textbook/desk around DE **novel/snack** fully have three
"*There are in total three novels/snacks around under the textbook/desk*."

Results We fitted Bayesian hierarchical models on log RTs of the classifier and two spillover regions (SP1 and SP2) and used Bayes factors (BF_{10}) for hypothesis testing (a BF_{10} larger than 1 provides evidence for the alternative hypothesis while a BF_{10} smaller than 1 provides evidence for the null hypothesis). In all experiments, there is a main effect of target match whereby match conditions have faster RTs. For **Exp1** (N=80), there is evidence for an interaction at SP2 (BF_{10}>100 under all priors). Follow-up nested analysis suggest that in *target match conditions*, there is inconclusive evidence regarding the effect of distractor match, while in *target mismatch conditions*, distractor match causes speedups (BF_{10}>21 under all priors). **Exp2** (N=100) replicates the basic pattern of Exp1 and provides additional evidence *against* the presence of a distractor match effect in target match conditions (BF_{10}<0.18 under all priors). **Exp3** (N=95) and **Exp4** (N=205) yielded similar results, whereby BF_{10} provides evidence against the presence of an interaction effect under large priors and inconclusive evidence under a tight prior.

Discussion Our results are largely in line with existing work on similarity-based interference, in that we found in consistent facilitatory interference in target mismatch conditions but no interference effects in target mismatch conditions in retroactive settings (e.g., Wagers et al., 2009). These results suggests that semantic cues from classifiers can be employed during retrieval, which is susceptible to interference, at least in the target mismatch conditions, and that similar memory mechanisms may underlie the processing of different dependency types. In addition, we did not find any evidence for proactive interference, which is consistent with previous studies that generally found proactive interference to be weaker, presumably due to decay (e.g., Van Dyke & McElree, 2011).

THE EFFECTS OF SEMANTIC RADICAL CONSISTENCY ON CHINESE CHARACTER NAMING: A CORPUS-BASED APPROACH

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Within the triangle modeling framework of reading (Seidenberg & McClelland, 1989), reading can be achieved via two main pathways, the orthography-phonology-semantics (OPS) pathway and the orthography-semantics (OS) pathway. The interaction of both pathways in Chinese character reading has been demonstrated by Dang et al. (2019) using a word naming task. The cooperative nature between OPS and OS pathways revealed that successful reading requires the integration of phonological and semantic information. In Chinese, semantic radicals usually carry information about the meaning of Chinese characters. A semantic transparent character refers to the fact that the meanings of characters can be inferred from their semantic radicals. Past studies used semantic rating tasks to measure semantic transparency and revealed a robust effect on word reading (e.g. Dang et al.,2019). However, this rating approach cannot measure semantic transparency from a large sample size. Moreover, it is subjective and time-consuming. Therefore, this study provided a novel, corpus-based measure for semantic transparency in Chinese character reading, termed *semantic radical consistency* (SRC). SRC was computed on the basis of the Chinese Word2Vec space based on Academia Sinica Balanced Corpus 4.0 (Huang & Chen, 1998). We first grouped Chinese characters based on their semantic radicals, and then calculated the mean pair-wised cosine similarity scores between semantic vectors of Chinese characters within the group.

To evaluate the SRC, two approaches were used. First, we conducted linear mixed-effect modelling (LMM) analyses to verify the explanatory power of SRC on character naming RTs, taken from a large-scale Chinese psycholinguistic database (Chang et al., 2016). Specifically, we used LMM models to examine the interaction between SRC and phonetic radical consistency (PRC) (i.e., a predictor that has been regarded a pivotal factor in character naming). Secondly, we conducted a word naming task in a 2 (SRC: transparent, opaque) x 2 (PRC: consistent, inconsistent) factorial design. Forty participants were recruited to participate in the naming task. Importantly, the SRC level was calculated by our novel SRC measure.

In line with the behavioral study by Dang et al. (2019), we anticipated finding faster RTs for transparent characters during low PRC conditions, which was an important indication of the use of phonological and semantic reading pathways in Chinese character processing. As predicted, the LMM results revealed significant interactions between PRC and SRC (Fig.1A). Similarly, the word naming results revealed not only significant SRC and PRC effects, but also the critical interaction effect between SRC and PRC (Fig.1B) in the RT analysis.

Overall, both the LMM and factorial naming results were consistent with the findings reported in Dang et al. (2019), showing that our SRC measure is a reliable predictor that accounts for Chinese naming performance. Moreover, our results also demonstrated the cooperative nature between phonological and semantic reading pathways, suggesting that when the information carried by phonetic radicals was not reliable, the information carried by semantic radicals was likely to be employed for character naming.

(A) (B)

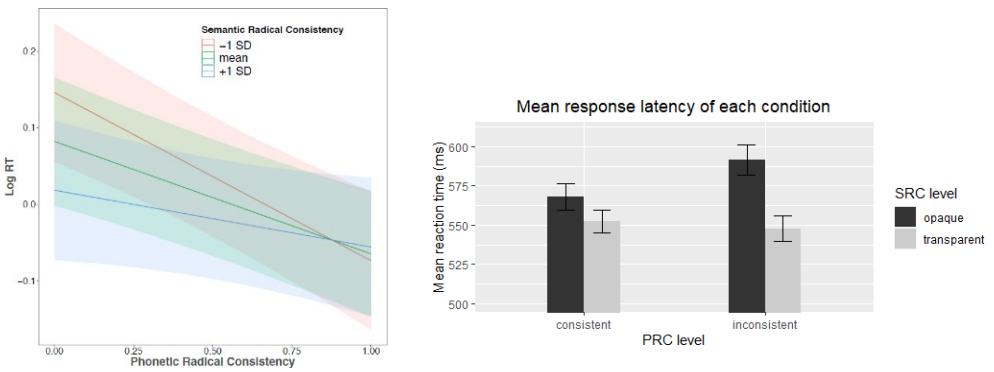

Figure 1. The interaction between SRC and PRC in LMM analyses (A) and ANOVA analyses of the word naming task (B).

DOES INNER SPEECH IN SILENT READING FACILITATE EMOTIONAL PROCESSING?

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Written stories immerse readers in complex, imaginative worlds (Gerrig, 2018) and bring fictional characters to life through vividness and complexity in their voices (Alderson-Day, Bernini, & Fernyhough, 2017). Readers often experience such imaginary voices as inner speech, especially when reading direct speech quotations (e.g., *He said, "I'm hungry!"*) (Yao, Belin, & Scheepers, 2011; Yao & Scheepers, 2011). While spoken language conveys rich information about a speaker's identity, intentions, and emotions (Scherer, 2003), the impact of inner speech on emotional processing remains unclear.

Experiment 1 asked native English speakers to rate a protagonist's emotional arousal in emotionally-neutral Direct Speech (*Carol replied, "I already know that"*), Indirect Speech (*Carol replied that she already knew that*) and Non-Speech (*Carol realised that she already knew that*) sentences. Direct speech sentences led to higher arousal ratings and faster reaction times than Indirect speech and Non-Speech sentences. This suggests that direct speech elicits increased emotions, and quicker emotional access than indirect speech.

Experiment 2a tested whether this increased emotional access is driven by inner speech in silent reading of direct speech quotations. Readers suppressed inner speech by repeatedly articulating "bah bah bah" while reading, or engage their manual motor functions by repeatedly tapping their fingers. Direct speech was rated more arousing and was rated significantly faster than indirect speech. However, the direct speech advantage in emotional access (reaction times) was more pronounced during articulatory suppression than during finger tapping.

Experiment 2b examined the effect of enhancing inner speech by silently mouthing the words. Results indicated that direct speech was rated significantly more arousing and was rated significantly faster that indirect speech. The direct speech advantage in emotional access (reaction times) was more pronounced with silent mouthing than without, suggesting that enhancing inner speech facilitates emotion judgements in direct speech.

Experiment 3 aimed to understand inner speech's role in emotional processing without any secondary tasks. It compared arousal judgements between reported speeches and thoughts. Direct reference, whether speech or thought, were rated more arousing and elicited faster reaction times. A significant interaction between reference (direct, indirect) and type (speech, thought) revealed that the direct reference advantage for emotional access (reaction times) was more pronounced for thoughts over speeches, suggesting that inner thoughts may provide better emotional access than inner speech.

In summary, direct speech in narratives enhances readers' emotional access to fictional characters. Although evidence indicates that engaging the speech production system, with inner speech either suppressed or enhanced, increases this emotional access, the exact relationship between speech production and emotional processing remains warrants further investigation.

Title: BILINGUAL LANGUAGE COACTIVATION – TRANSLATION EQUIVALENTS OR CONCEPTUAL OVERLAP?

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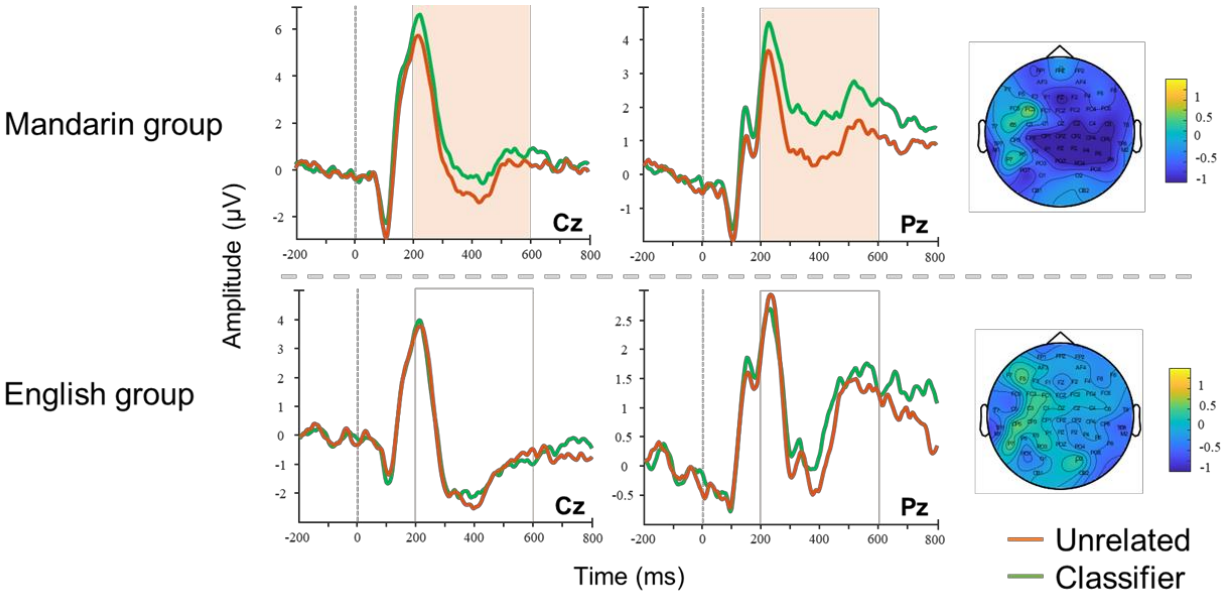
Abstract

Considerable evidence of language coactivation has led the field of linguistics to the general consensus that bilingual language processing involves simultaneous activation of both the native (L1) and second (L2) system(s). In strong support of this is research demonstrating unconscious L1 translation activation during L2 language processing, typically evidenced by the influence of L1 wordform features on L2 processing. For example, the word 'thing' when translated to Chinese is the compound *dōngxī*东西, the first character of which means 'east'. For Mandarin-English bilinguals, the seemingly unrelated English words 'thing' and 'east' will prime one another, suggesting processing facilitation derived from their relationship in the contextually irrelevant L1. Typically, such priming effects have been attributed to the activation of – and overlap between – L1 form representations (i.e., phonology, orthography), but more recently an alternative account has been proposed – one in which second language learning supposedly lends itself to the "carrying over" of L1 relationships. In this account, novel L2 input (words) is initially mapped on to L1 semantic representations. Such a process results in an L2 language system largely resembling the native system. Priming between 'thing' and 'east' thus occurs because these English words harbour *Mandarin* relationships, omitting the necessity of translation-form activation. To explore whether priming in the L2 could result from L1 conceptual relationships (in the absence of L1 form overlap), we tested 28 Mandarin-English bilinguals in an ERP study. Critical primes and targets were unrelated in English but shared a nominal classifier in Mandarin (e.g., towel – snake, each of which use the nominal classifier *tiáo*/条). By pairing words that shared a classifier, we thus manipulated semantic relationships between stimuli that were present in the L1, but seemingly absent in English. Relative to unrelated controls, targets primed by words from the same classifier category elicited a smaller N400 (p<.001) in the bilingual group, but not in a native English control group (N=27; p=.128). These findings suggest that first language conceptual relationships influence L2 processing, and that L1 translation form activation may not be a necessary pre-requisite for L1 priming in an L2 context.



RAPID SEMANTIC UPDATING DESPITE PREDICTION ERRORS: EYE-TRACKING EVIDENCE FROM MANDARIN CHINESE

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Comprehenders can predict upcoming language based on global context [1-2] and use disconfirming evidence or informative cues to update their predictions rapidly [3-5]. However, a recent study found that prediction failure hinders local semantic processing [6]. To further examine possible costs induced by prediction errors, we built on the design of [3] to use an unexpected nominal classifier to signal a prediction error and manipulated the adjective that follows. Our results suggest that listeners can use an informative cue to update their prediction even when it immediately follows an early sign of prediction error.

Participants (n=50) listened to Mandarin Chinese sentences while viewing four candidate objects on the screen (Fig. 1). The sentential context strongly predicted a particular noun (e.g., *shù*-tree) but always ended with an unexpected target noun (e.g., *zhuōzi*-table). We manipulated nominal classifiers (specific vs. general) and adjectives (informative vs. uninformative) preceding the target noun. The **specific classifier** was compatible with the target and competitor (e.g., *yǐzi*-chair) but incompatible with the initially-expected noun, serving as an indicator of prediction errors. The **informative adjective** uniquely matched the target noun, enabling prediction updating. The general classifier and the uninformative adjective were compatible with all the candidate nouns.

We observed that, after encountering a specific (relative to a general) classifier, listeners were more likely to look toward the unexpected target. As the sentence continued, they increased looks to the unexpected target upon hearing an informative (relative to an uninformative) adjective no matter whether it follows a specific or a general classifier (Fig. 2). The generalised additive mixed model showed a significant main effect of classifier ($p < .001$) and adjective ($p < .001$) but no interaction ($p = 0.86$). We then did a bootstrapping analysis [7] to directly compare the onset of divergence following a specific vs. general classifier (Fig. 3). The difference in the divergence points was only 15 ms (95% CI = [-80, 120]), suggesting that listeners were equally quick to use the informative adjective to update their noun prediction no matter whether they had just encountered a prediction error or not.

In conclusion, the present study reveals no measurable costs of prediction errors on subsequent semantic processing.

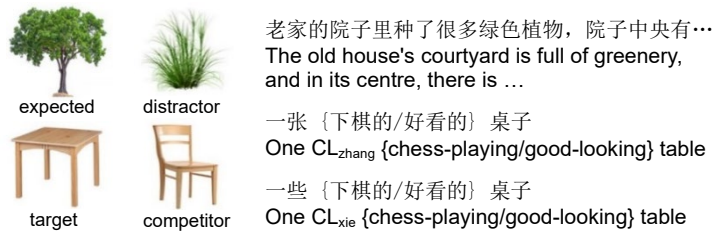

Figure 1. Sample material and visual display

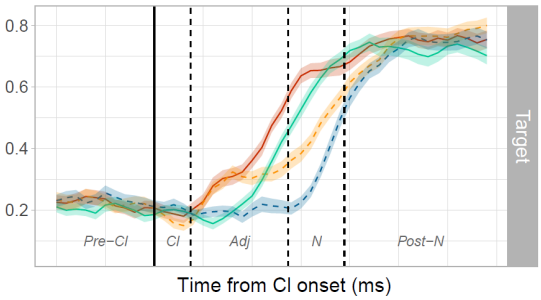

Figure 2. Proportions of looks to unexpected target, time-locked to the classifier onset (0 ms), across four conditions. Standard errors were shown in semi-transparent shades.

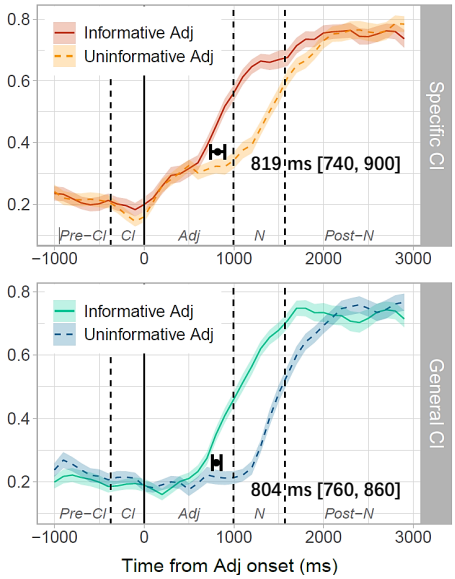

Figure 3. Proportion of fixations to the unexpected target object, time-locked to the adjective onset (0 ms). Points indicate the bootstrap means of the onset of divergence. Error bars represent 95% percentile confidence intervals.

Reference:
[1] Kamide et al. (2003). J Mem Lang. [2] Altmann & Kamide. (2007). J Mem Lang. [3] Chow & Chen. (2020). Lang Cogn Neurosci. [4] Chen, et al. (2022). AMLaP28, York, UK. [5] Szewczyk, et al. (2022). J Exp Psychol Learn Mem Cogn. [6] Husband & Bovolenta. (2020). Lang Cogn Neurosci. [7] Stone, et al. (2021). Biling: Lang Cogn.

FRONTOPARIETAL INTERACTIONS UNDERLAY VISUOSPATIAL ORTHOGRAPHIC PROCESSES IN CHINESE READING

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As a logographic writing system, Chinese reading encompasses the processing of visuospatial orthographic properties. Our study aimed to investigate the functional correlates supporting visuospatial orthographic processes as compared to semantic and phonological processes in Chinese reading. We conducted a functional MRI single-character reading study in Chinese, in which 35 right-handed native Chinese young adults were asked to make orthographic judgments (i.e., whether the orthography of a character contains a radical "又", such as a target "对"), phonological judgments (i.e., whether the phonology of a character contains the vowel of "ong", such as "红, /hong2/"), and semantic judgments (i.e., whether the meaning of a character is an animal, such as "狗, dog"). Stimuli were visually presented in separate task-specific (orthographic, phonological, semantic) activation blocks that were alternated with rest-fixation blocks. Our results revealed that visuospatial orthographic processes in Chinese reading, as compared to semantic processing, involved stronger right hemisphere engagement. Stronger left vOTC-SPG-MFG functional connectivity was found for orthographic relative to semantic processing, and it was associated with reduced regional engagement, which suggests that processing visuospatial orthographic processes in Chinese rely on functional interactions among regions rather than on regional processes taking place in each of them. In conclusion, our study tackles one of the main specificities of Chinese writing code, holding important implications for current models highlighting visuospatial orthographic processes and the brain networks supporting it in Chinese reading.

L1 AND L2 MANDARIN SPEAKERS PREDICT UPCOMING ARGUMENTS IN DATIVE CONSTRUCTIONS BASED ON CATEGORICAL AND GRADIENT VERB INFORMATION

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In the first study on predictive processing of dative verbs in Mandarin, Chen et al. (2022) employed a visual-world structural priming paradigm and found that Mandarin speakers' predictions of upcoming arguments were influenced by both prime type and gradient verb bias, i.e., the likelihood of an alternating dative verb to occur in a prepositional object (PO) construction or a double object (DO) construction. Yet it remains unclear whether verb-bias effects can be observed without priming. The present study further investigates the role of prediction in the processing of Mandarin dative constructions by (i) examining processing in the absence of priming, (ii) including categorical constraints (i.e., non-alternating dative verbs that can occur in PO or DO only) in addition to gradient bias for alternating verbs, (iii) including a longer ambiguous region between the verb and the first post-verbal noun (Fig.1), and (iv) testing both native speakers (L1) and classroom learners (CL) of Mandarin.

Method: L1 (*N*=59) and CL (*N*=60) participants completed a visual world eye-tracking experiment in which they listened to a speaker describe visual scenes containing three entities (agent, theme, goal; Fig.1). Ten dative verbs (6 non-alternating PO-only MAKE (*k*=3) and DO-only TELL verbs (*k*=3) and 4 alternating GIVE verbs) were included.

Results: We used LMER models to examine the likelihood of participants looking at the theme vs. the goal (log-ratio) during two critical ambiguous time windows (CR1=verb; CR2=aspect marker+numeral+general classifer; Fig.1). We interpret changes in looking from CR1 to CR2 as evidence of prediction based on verb information. For **non-alternating** verbs (Fig.2), the model returned an interaction between window (CR1, CR2) and verb type (MAKE, TELL), *b=-.37, p<.001*; no effects or relevant interactions with Group, indicating from CR1 to CR2, both L1 and CL participants predicted a theme following MAKE verbs (*b=.24, p<.001*), and a goal following TELL verbs (*b=-.12, p=.001*). For **alternating** verbs (Fig.3), the model returned an interaction between window (CR1, CR2) and verb bias (DO vs. PO bias), *b=.24, p<.001*; no effects or relevant interactions with Group. L1ers and CLs predicted a theme following PO-biased verbs (*b=.22, p<.001*).

This study provides new evidence of active prediction of the Mandarin dative alternation (a) in the absence of priming, and (b) among both native and non-native speakers, indicating these effects generalize across different types of language users.

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Fig.1. *Illustration of experimental item (PRF = perfective marker; CL = general classifier)*

	CR1	CR2						
Nanren	song	le	yi	ge	daxuesheng	yi	ge	shafa.
Man	give	PRF	one	CL	college student	one	CL	sofa

"The man gave a college student a sofa.

Fig.2. *Proportion looks for **non-alternating** verbs*

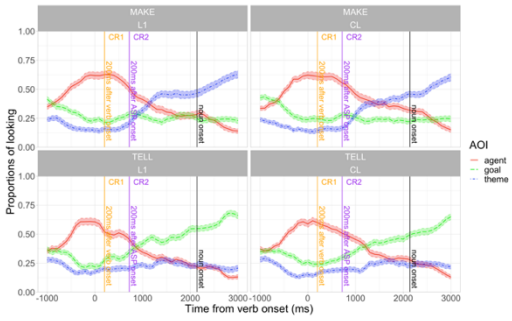
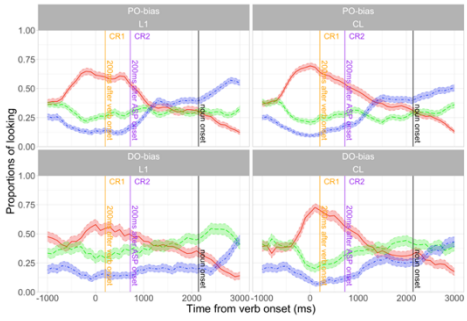


Fig.3. *Proportion looks for **alternating** verbs*



AUDIOVISUAL PERCEPTION OF MANDARIN TONES BY CHILDREN WITH COCHLEAR IMPLANTS

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Cochlear implants (CIs) have made oral speech communication possible for many children with hearing loss. However, tonal perception is still challenging since CI devices cannot code pitch effectively. In most daily speech conversations, both audio and visual (e.g., speakers' mouth movements) cues are available. It has been shown that visual cues greatly benefit children with CIs to perceive vowels better, especially in noise, with children implanted earlier showing greater visual benefits. However, it was unclear if this is also the case for tonal perception. Moreover, evidence shows that Mandarin tonal productions are characterized by distinct facial movements, but such movements are less distinct in connected speech (utterances) relative to citation forms. It was therefore unclear whether visual benefits on tonal perception (if any) exist in both citation and connected speech contexts.

To address these issues, this study tested children with CIs' audiovisual perception of Mandarin tones in citation forms (Experiment 1) and connected speech (Experiment 2). We predicted that, in both contexts, the tonal recognition accuracy would be higher in the audiovisual (AV) condition relative to the audio-only (AO) condition, especially when noise is presented. Furthermore, children implanted earlier would exhibit a larger visual benefit in tonal perception.

Experiment 1 tested 82 3-7-year-old children with CIs (implantation age: 0.5-5 years) and 82 age-matched NH controls. Stimuli included 36 picturable monosyllables carrying all tones, video-recorded by a native female speaker. In each trial, a child was presented with a target stimulus in AO or AV modality and in quiet or noise (0dB babble), and then required to select the corresponding picture from two pictures varying in tones.

The results showed that only the CI group has improved their tonal recognition accuracy from AO to AV condition, but only in the noise condition. Pearson-correlation tests performed on implantation ages and visual benefits (accuracy differences between AV and AO conditions) for children with CIs reported a negative correlation in the noise condition.

Experiment 2 tested additional 63 3-7-year-old children with CIs (implanted age: 0.7-7 years) and 63 age-matched NH controls. The procedure was similar to that of Experiment 1, except that all target syllables were produced and presented with a carrier sentence "请找到 X 这张图" *please fine the picture of X*.

The results showed that, similar to Experiment 1, only the CI group has improved their tonal recognition accuracy from AO to AV condition in the noise condition. However, implantation ages were not correlated with visual benefits in any condition.

Our results, for the first time, demonstrated that children with CIs were able to use visual cues to facilitate their tonal perception when audio information is degraded in noise, and such visual benefits existed in both citation and connected speech contexts. Furthermore, children implanted earlier showed a stronger ability to integrate visual information into tonal perception in noise. The implications for hearing and speech rehabilitations and early neural plasticity in audiovisual integration are discussed.

How Chinese Changed My (Research) Life

Catherine (Cammie) McBride
Purdue University

Abstract

Models of word recognition have been strongly influenced by native English-speaking theorists, who have tended to embrace relatively fixed notions of various important concepts, such as "word" and "morpheme." While there are many "universals" of basic literacy learning, there are also a number of differences between Chinese and English in how to learn to read and to write words, and, indeed, in whether "word" is the most appropriate unit of focus in literacy learning at all. In this talk, I will highlight research that changed my notions of cross-cultural literacy learning with a special emphasis on Chinese. For example, I will discuss the centrality of lexical-compounding, characters (vs. words), and copying for early literacy-learning in Chinese, as well as how phonological aspects of literacy learning are more ambiguous but in some ways better marked in Chinese as compared to English. This Chinese-English contrast has both theoretical and practical implications for understanding how children learn to read and write across languages, scripts, and cultures.

About the speaker

Catherine (Cammie) McBride is currently Professor in the Department of Human Development and Family Science and Associate Dean for Research for the College of Health and Human Sciences at Purdue University. She was previously a Choh-Ming Li Professor of Psychology at The Chinese University of Hong Kong. In 2022, she and her team received approximately USD4 million in grant money to study literacy development and impairment across both Chinese and English in Chinese children. Professor McBride previously served as President of the Society for the Scientific Study of Reading (SSSR) and Founding President of the Association for Reading and Writing in Asia (ARWA). McBride currently serves on the Board of The Reading League—Indiana and is co-leading a USD1.5 million dollar grant from the Lilly Foundation to improve teacher training in the science of reading in Indiana at Purdue University. A Fellow of the Association for Psychological Science (APS), she was selected to be a 2024 winner of the APS Mentorship Award. Much of Professor McBride's current research is devoted to improving online assessment and training of literacy and mathematics skills. The author of more than 250 peer-reviewed journal articles and editor of six books, McBride wrote both *Children's Literacy Development: A Cross-Cultural Perspective on Learning to Read and Write* (2016) and *Coping with Dyslexia, Dysgraphia, and ADHD: A Global Perspective* (2019). Her most recent (as co-editor) book (2023) is entitled the *Routledge International Handbook of Visual-Motor Skills, Handwriting, and Spelling: Theory, Research, and Practice*.

Day 1 Poster Presentations

December 1, 2023

PSYCHOLINGUISTIC DETERMINANTS OF TIMED OBJECT NAMING IN THAI

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In this study, we report normative data by native Thai speakers for name agreement, image agreement, category agreement, object familiarity, visual complexity, age of acquisition in addition to values for word length, word frequency, and object naming latency for 332 high quality colour photographs of common objects from the Bank of Standardized Stimuli (BOSS; Brodeur, Dionne-Dostie, Montreuil, & Lepage, 2010). Thirty-two participants from Chulalongkorn University in Bangkok, Thailand, performed a speeded object naming task with naming latency measured using a voice-activated response box. We assessed the contribution of the eight predictor variables on object naming times using multiple regression analysis and found independent effects of the following psycholinguistic variables: name agreement, image agreement, age of acquisition, word frequency, object familiarity, and category agreement. Jointly these variables accounted for just under 50% of the overall object naming variance.

Previous studies have routinely identified name agreement, image agreement, age of acquisition, and word frequency as major determinants of picture naming speed; a consistent pattern obtained across multiple languages (e.g., Alario et al., 2004; Bakhtiar, Nilipour, & Weekes, 2013; Bonin, Peereman, Malardier, Méot, & Chalard, 2003; Cuetos, Ellis, & Alvarez, 1999; Snodgrass & Yuditsky, 1996). While the current findings reveal that the same psycholinguistic properties are predictive of naming in Thai, they extend this work by showing that the same properties also underlie naming with more ecologically-valid stimuli than have been used previously (e.g., Snodgrass & Vanderwart, 1980). We interpret these findings in relation to current models of lexical access and picture naming, which posit that several distinct processing stages are selectively influenced by specific psycholinguistic variables during the speech production process.

Overall, our findings support the use of the BOSS as a valid and ecological alternative image database, especially, but not exclusively, for Thai-speaking populations. We anticipate that the Thai normative data will be useful for investigations of language processing in normal Thai speakers as well as patients with acquired or developmental language disorders such as aphasia and dyslexia.

ON CANTONESE HERITAGE SPEAKERS' CLASSIFIER EPISTEMOLOGIES THROUGH SEMANTIC AND GRAMMATICAL CUES

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An area of confusion among heritage speakers of Chinese is classifier epistemologies of determining which classifier to use for functional and/or geometrical categories with nouns. Heritage Language (HL) acquisition is a type of bilingual first language L1 acquisition (Mai & Deng, 2019, cited from Montrul, 2008, 2016; Polinsky, 2007; Rothman, 2009). Heritage language development is defined as a speaker who grows up with the language they speak (or perhaps, only listen to) in a heritage/minority language as their first language, but a majority language (such as English) is used in societal needs, which dominants the heritage speakers' first language development. In this vein, the current study examines the classifier epistemologies of Cantonese heritage speakers, and how semantic and grammatical cues can aid in the processing of classifiers. The primary motivation of the study was to check the study's findings and confirm in what has been found in the research literature.

We show that (i) heritage speakers acquire native-like classifier epistemologies similar to native speakers of Cantonese, and through closer examination (ii) heritage speakers of Cantonese seem to employ similar strategies found in Grüter, Lau, and Ling (2020). Grüter and colleagues compared L1 and L2 speakers of Chinese, classifiers constitute a dual source of information, which is (i) purely semantic, and (ii) formal property of the grammar, the classifier system.

Method. By using Tsang and Chambers' (2011) Cantonese stimuli, we tested the participants' knowledge of through a visual world experiment, as well as a vocabulary test to assess participants' knowledge of the target classifier-noun pairings (n=20, age 18-40yrs); participants looked at visual scenes through a SMI RED250 eye-tracker at 250 Hz, or a mobile REDn Scientific eye-tracker at 60 Hz). Gaze data were classified automatically as fixations.

Results. The eye-tracking data reveals the fixation of classifiers in functional categories, which illustrates that the semantic compatibility with the target is of no relevance. Heritage learners seem to have some sort of understanding for semantic cues with functional categories, such as tools and vehicles, but have longer processing times for geometrical categories like cylindrical and small and round objects.

We further examined Cantonese heritage speakers' preference for using the abstract noun classifier 個 *go3*, which is often the default choice as it is deemed as "safe" and reliable in classifier-noun pairs. The overreliance of 個 *go3*, may be attributed to a lack of conceptual understanding that there are different categories for specific nouns, and specific geometrical and functional categories that nouns are categorized into when using classifiers. We conclude that classifiers in Cantonese are acquired with ease, but a delayed understanding of classifier epistemologies are found through semantic and grammatical cues.

GRAMMATICAL GENDER IS REFLECTED IN LANGUAGE'S DISTRIBUTED SEMANTIC REPRESENTATIONS

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It has been proposed that sex-based grammatical gender on inanimate nouns “rubs off” on concepts, such that, for instance, Italian speakers conceptualize ‘spoon’ as more masculine than Spanish or French speakers do. Here, we provide an explicitly computational account of this interaction of grammatical gender and conceptual representations. We examined semantic embeddings generated from distributional semantics models, wherein the semantics of words is represented by vectors of real number values extracting their contextual co-occurrence with other words. As such, word embeddings sharing similar contexts have more similar semantic vectors (e.g., 'flight' and 'plane' versus ‘apple’ and ‘orange’). Embeddings are compatible with a dynamical systems approach to language and mimic the semantic structure found in the cognitive architecture of humans. We propose that gender biases on inanimate nouns may originate by associations from both their surrounding context like gender-marked determiners (in Italian, ‘il/gli’ and ‘la/le’ indicate respectively masculine and feminine animate and inanimate nouns) or adjectival agreement morphemes, and word-internal similarities (e.g., both animate and inanimate nouns ending in -o and -a refer respectively to male and female nouns).

We analyzed pre-trained FastText embeddings of inanimate nouns in 16 languages with grammatical gender (e.g., Arabic, Hindi, Italian, Spanish), and 1 non-gendered language as control (English). For each language combination (total n = 136), we selected inanimate nouns in Wiktionary (min set = 253, max set = 2821) that were of opposite grammatical gender, and of course neutral in English, resulting in word triplets [e.g., "spoon", "cucchiaio" (masculine) in Italian, "cuchara" (feminine) in Spanish]. This controlled for words’ intrinsic semantics, providing a comprehensive and fair cross-language comparison.

The Semantic Proximity Difference (SPD) is a metric that captures the disparity between the word embedding's similarity to 8 reference words of intrinsic female semantics (‘woman’, ‘girl’, ‘sister’, etc.) and its similarity to 8 male reference words (‘man’, ‘boy’, ‘brother’, etc.). For example, SPD can be computed as: *SPD = cosine('cucchiaio', 'femmina') – cosine('cucchiaio', 'maschio')*. A positive value indicates a stronger similarity to female reference words, while a negative value suggests a stronger similarity to male reference words. We utilized linear mixed models with SPD scores as dependent variable, grammatical gender as a three-level factor (neutral, feminine, masculine), and word triplets as a random effect nested in language pairings. Across all gendered languages, FastText word embeddings were closer to the set of reference words aligning with their noun's grammatical gender (χ^2 = 101610.49, p < .001, η^2 = 0.25). Specifically, the effect size of the female-neutral gender contrast was 0.822 (95% CI [0.815, 0.829]), and the male-neutral gender contrast effect size was -0.296 (95% CI [-0.303, -0.288]), both in the expected direction.

To compare the gender effect size between Word2Vec and FastText models, we conducted an analysis on the intersection of the two sets of embeddings, encompassing 10 languages and a total of 17,408 inanimate nouns. The results show that Word2Vec models, which didn't incorporate subword information during training, had a smaller gender effect size (η^2 = 0.20) compared to the FastText models (η^2 = 0.45) that did include subword information in their training. This is in line with our hypothesis that grammatical gender may shape lexical semantics by leveraging both sub-lexical and contextual distributional similarities among words. These masculine/feminine semantic features are showing up in language statistics that do not *directly* incorporate sensorimotor experience, suggesting that much of the embodiment in language processing might become statistically embedded in how words are used.

DEEP OR NOT? SPEECH PROCESSING IN SIMULTANEOUS INTERPRETING

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Speech processing is of great significance in simultaneous interpreting (SI). Psychology studies suggest that different SI processes (e.g., speech recognition and production) require access to the same limited resources to efficiently and accurately interpret a speech. These processes may interfere with each other due to a bottleneck in processing capacity. This interference can affect the depth of processing in speech recognition. Here we asked: Can source speech be processed deeply or not in SI? Drawing on existing knowledge (Jongman & Meyer, 2017), we combined a priming paradigm with a picture naming task to address this question. Interpreters and non-interpreters were presented with the spoken name (the prime) of an object, followed by a sequence of two pictures on the screen. The participants' task on each trial was to name the target (second) picture aloud as quickly as possible. We manipulated whether the prime was identical (e.g., spoken word "car" and picture of car) or semantically unrelated to the target picture (e.g., picture of guitar). There were two additional conditions to further test the depth of processing. In the no-production condition, the first picture was not named by participants but had its spoken name presented along with it. In the production condition, participants named both pictures. These conditions allowed us to determine if interference between speech recognition (of the prime) and speech production (naming the first picture) differed between interpreters and non-interpreters. As expected, priming effects were larger in the no-production condition, but did not differ between interpreters and non-interpreters. Interpreters also named target pictures equally quickly across the two conditions whereas non-interpreters named target pictures more slowly in the production condition. We conclude that SI experience increases depth of processing. We also discuss how our findings inform stakeholders in SI and psychology.

SYNTACTIC BOOTSTRAPPING IN MARATHI

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Marathi (Indo-Aryan) is a split-ergative language: ergative-absolutive voice in the perfective; nominative-accusative in the imperfect. In this paper, we show that case marking in both voices influences frame-compliance (Naigles et al., 1993), showing that native-speaking Marathi children (and adults) actively use case information when processing interpretations of verb transitivity. Surprisingly, Marathi heritage children show case resilience and also integrate case information when determining verb transitivity, despite the fact that case is thought to be a vulnerable feature in heritage speakers (Kim et al. 2018),

Verb learning is notoriously challenging (Gleitman, 1990, a.o.), leading Naigles (1993) to propose that children are FRAME-COMPLIANT - a form of syntactic bootstrapping wherein a frame (represented by language features like number of arguments) is used to infer something about the meaning of the verb. This is a first-pass mechanism to infer transitivity. Goksun et al. (2008) find that in Turkish the presence of accusative case increases frame-compliance – a fact that comports with Polinsky's (2011) argument that accusative case is the marked/dependent case in NOM/ACC languages, allowing for the inference of transitivity. Polinsky additionally asserts that ergative is the dependent case in ERG/ABS languages from which we assume ERG to be the salient cue in the perfective for Marathi children. However, case is known to be a vulnerable feature in heritage speakers (Kim et al., 2018; Chondrogianni & Schwartz, 2020), and we therefore investigate whether heritage Marathi children make use of case to the same degree native Marathi children do.

Child participants (India data collection complete, USA heritage data collection in progress) were tested with a picture selection task and elicited verbal correction in three conditions: ERG condition (A), ACC condition (B) and a (control) bare-case condition (C). Results indicate that both groups show strong frame-compliance based on dependent case marking (ERG and ACC). We conclude that case is surprisingly resilient in heritage Marathi and serves as a key feature for syntactic bootstrapping in the language, though which dependent case marker in the two alignment systems is more salient differs between the heritage and child populations (possibly due to English influence in the heritage speakers).

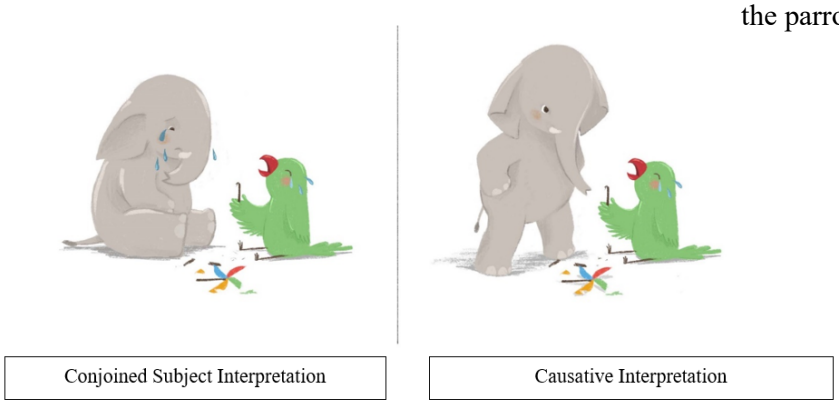
Example Sentences

A. hətti-**ni** popət rəd-l-ə
Elephant-**ERG** parrot cry-PST-NEU
Predicted Interpretation: "The elephant made the parrot cry"

B. hətti popt-a-**la** rəd-t-ə
Elephant parrot-MASC-**ACC** cry-PRES-NEU
Predicted Interpretation: "The elephant made the parrot cry"

C. hətti popət rəd-t-ə
Elephant parrot cry-PRES-NEU
Predicted Interpretation: "The elephant and the parrot cried"

Figure 1.



Conjoined Subject Interpretation | Causative Interpretation

THE EFFECT OF POLARITY ON SCALAR IMPLICATURE PROCESSING

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A sentence containing a scalar word (e.g., *some*) often carries a scalar implicature (SI), which is the negation of its stronger alternative from the same scale (e.g., *not all*). Conflicting evidence has been found regarding the question whether SI processing is costly or delayed [1-2]. While previous studies have primarily focused on the lexical scale of <*some*, *all*>, recent findings suggest that generalisations across all lexical scales may not hold [3]. [4] tested the cognitive processing of seven scales by measuring response times in a truth-value judgement task and by measuring responses in a memory load task. It was found that the SIs of positively scalar words (e.g., *some*, *or*) were associated with a processing cost, but those of negatively scalar words (e.g., *low*, *scarce*) were not. One possible explanation for this processing difference is that positively scalar words introduce negative SIs (e.g., *some* implies *not all*), while negatively scalar words introduce positive SIs (e.g., *scarce* implies *present*). Consequently, the observed processing cost of positively scalar words may be attributed to the difficulty of processing negative information. Building upon these findings, our study aims to examine the effect of polarity on the real-time processing of different scalar words.

Three experiments were conducted: two self-paced decision tasks (Exp1-2) and a visual-world eye-tracking study (Exp3). In Exp1, participants viewed a scene with four objects while reading sentences that contained either positively scalar words (*usually* or *always*) or negatively scalar words (*rarely* or *never*). Using the same paradigm, Exp2 tested two additional scalar pairs, namely <*some*, *all*> and <*not all*, *none*>. In both experiments, sentences were presented in a self-paced manner (Fig. 1). Participants advanced through the sentences by clicking on the object they believed the sentence described. In Exp3, participants were presented with the same displays as in Exp1-2. They listened to sentences containing scalar words (using the same words as in Exp 1), while their eye movements were recorded. The participants' task was to click on the referent of each sentence.

All three studies employed a 2x2 design, with polarity (positively or negatively scalar) and strength (weak or strong word) as repeated-measure factors. The critical window for analysis started from the appearance/onset of the scalar word and ended just before the appearance/onset of the colour word (also the disambiguation word). During this window, the literal interpretations of stronger words (e.g., *always, never*) were sufficient for determining the correct reference. However, weaker words (e.g., *usually*, *rarely*) were referentially ambiguous based on their literal interpretations alone, and the correct reference could only be identified by computing their SIs. In Exp1-2, we found an interaction between strength and polarity (p = .01): the proportion of target clicks was lower for sentences with *usually* or *some* compared to those with *always* or *all*; no significant difference was observed between sentences with *rarely* or *not all* and those with *never* or *none*. In Exp3, we found that target identification was not delayed when comparing sentences with *usually* to those with *always*, but was faster for *rarely* compared to *never*. These results suggest that the presence or absence of a processing cost for SIs is modulated by the polarity of scalar words. The process of deriving Sis incurs no cognitive cost, but a cost may emerge during verification if the SI expresses a negative proposition.

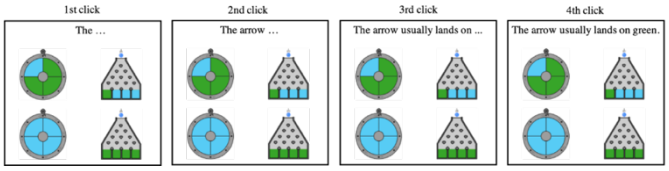

Fig.1

References: [1] Huang, Y. T., & Snedeker, J. (2009). *Cognitive Psychology*, *58*(3), 376–415. [2] Degen, J., & Tanenhaus, M. K. (2015). *Cognitive Science*, *39*(4), 667-710. [3] van Tiel, B., van Miltenburg, E., Zevakhina, N., & Geurts, B. (2016). *Journal of Semantics*, 33(1), 137-175. [4] van Tiel, B., Pankratz, E., & Sun, C. (2019). *Journal of Memory and Language*, *105*, 93-107.

DIFFERENT LANGUAGE CONTROL MECHANISMS IN COMPREHENSION AND PRODUCTION: EVIDENCE FROM PARAGRAPH READING

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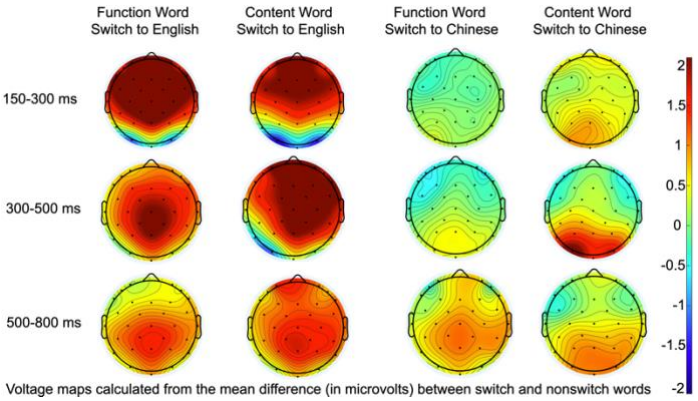
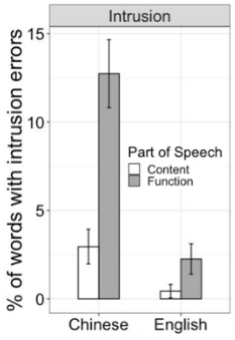
We investigated similarities versus differences in language control mechanisms across comprehension and production in-context. In Experiments 1 and 2, Chinese-English bilinguals that were dominant in Chinese (N = 24 in each experiment) read paragraphs with language switches using a rapid serial visual presentation (RSVP) paradigm silently while ERPs were measured (Exp 1) or read them aloud (Exp 2). Each paragraph was mainly written in either Chinese or English. In switch conditions, there were eight words switch to the other language in each paragraph, and these switch words were either content words with rich semantic properties or function words with rich syntactic properties. In nonswitch conditions, all words were in the same language. In both experiments, each word was presented for 250 ms, followed by a 250 ms blank. Each participant read six paragraphs in each condition with the Latin-square design (36 paragraphs in total). We examined how switch direction and part of speech affect language switch costs in comprehension (Exp 1) and production (Exp 2).

Function Word Switch to English	现在告诉 **me** 它在哪里
Content Word Switch to English	现在 tell **我**它在哪里
Nonswitch all Chinese	现在告诉**我**它在哪里
Function Word Switch to Chinese	Now tell **我** where it is
Content Word Switch to Chinese	Now 告诉 **me** where it is
Nonswitch all English	Now tell **me** where it is

In Experiment 1, we compared ERPs of switch words with their corresponding control words in the nonswitch condition. Language switches elicited an early, long-lasting positivity when switching from the dominant language Chinese to the nondominant language English; in the other switch direction, the positivity started at a later stage, and the size of the effect was smaller than or equal to that when switching to the nondominant language in the three time windows. In addition, switch effects on function words were not significantly larger than those on content words in any time window, in either switch direction. In contrast, in Experiment 2, participants produced more cross-language intrusion errors (e.g., saying *me* when seeing *我*) when switching to the dominant language Chinese than to the nondominant language English, and more errors on function words than content words, suggesting larger switch costs when switching to the dominant language and on function words. We did not measure ERPs in Experiment 2 due to massive artifacts of articulatory movement in connected speech. However, the qualitative differences across experiments in the present study still suggest that switch direction and part of speech affect comprehension and production differently. Switching to the nondominant language elicited larger switch costs in comprehension while switching to the dominant language elicited larger costs in production; there was no clear part of speech effects in comprehension, while the effects were salient in production. These qualitative differences suggested different language control mechanisms across modalities.



Voltage maps calculated from the mean difference (in microvolts) between switch and nonswitch words



PREDICTABILITY MECHANISM OF PRONOUN INTERPRETATION IN MANDARIN

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BACKGROUND A recent study found that null and overt pronouns in Mandarin were sensitive to topicality at a similar magnitude (Cui & Hwang, 2023). For example, when the subject was fronted and more topical (e.g., *Yixin yinwei zaiyi Shiqi, suoyi*… 'Yixin because cares Shiqi, so…'), Mandarin speakers were more likely to interpret both types of pronouns as referring to the subject compared to when the subject was in a canonical position (e.g., *yinwei Yixin zaiyi Shiqi, suoyi*… 'because Yixin cares Shiqi, so…'). This could be because topical entities are more accessible and/or predictable than non-topical entities (e.g., Givón, 1983). Using the same stimuli, earlier work showed that topical subjects were indeed more predictable than non-topical subjects (Lam & Hwang, 2022). The current study investigates whether predictability underlies the effects of topicality on null and overt pronoun interpretation in Mandarin.

EXPERIMENT To see if predictability guides pronoun interpretation, we manipulated the predictability of the subject with verb semantics while controlling for topicality. In (1), both subjects are non-topical but the subject is more predictable in (1a) than (1b) (Kehler & Rhode, 2013). We also manipulated pronoun types using *jiu* 'then' (null: *Ø jiu* '*Ø* then'; overt: *ta jiu* 'he/she then'). The adverb *jiu* occurs following the subject and before a predicate. Thus, when no explicit pronouns are present, *jiu* signals the presence of a null pronoun.

(1) a. yinwei Yixin zaiyi Shiqi, suoyi Ø/ta jiu… b. yinwei Zixi jinule Lili, suoyi Ø/ta jiu…
because Yixin cares Shiqi, so Ø/ta then… because Zixi irritate-PFV Lili, so Ø/ta then…
'Yixin cares Shiqi, so she…' 'Zixi irritated Lili, so she…'

Participants (N=56) were asked to read the prompt sentence and provide a natural continuation following either null or overt pronoun prompts. We predict that if predictability underlies the topicality effects on null and overt pronouns, Mandarin speakers will be more likely to interpret both pronouns as referring to the more topical subjects in (1a) than (1b) -- because more predictable subjects could be more topical. We analyzed whether participants interpreted the pronouns as referring to subjects or objects. Ambiguous responses and those referring to both subjects and objects were excluded from the analysis.

RESULTS We found that predictability affected both null and overt pronouns in Mandarin. However, there was an interaction between predictability and pronoun types: Overt pronoun interpretation was influenced by predictability to a greater extent than null pronouns (subject reference proportion for null pronouns: 99% vs. 81%; overt pronouns: 99% vs. 51%). Given that the topicality effects found in Cui and Hwang (2023) did not differ significantly between null and overt pronouns, we suggest that predictability may account in part for the topicality effect on the interpretation of null and overt pronouns in Mandarin, but it is not likely to be the only mechanism. While other mechanisms, such as accessibility (e.g., Ariel, 1990; Givón, 1983), could also underlie topicality effect, predictability might be a larger contributor to topicality for overt pronouns than for null pronouns.

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MODALITY-SPECIFIC LANGUAGE PROCESSING OF SPANISH MORPHOSYNTACTIC AND ORTHOGRAPHIC/PHONOLOGICAL VIOLATIONS: AN ERP STUDY

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While the effect of stimulus modality on behavioral performance is well-researched in psychology, its relevance in neurolinguistics is often underestimated, with the tacit assumption that language processing is largely modality-independent beyond its initial stages. However, we identify compelling evidence from five domains supporting the notion that stimulus modality significantly influences language processing post-sensory perception. These include functional neuroanatomy (distinct neural pathways for perception and mapping), temporal characteristics of sensory perception (instantaneous visual versus gradual auditory availability of information), the evolutionary development of reading (cortical exaptation and prevalence of reading disorders vs. listening disorders), the influence of sensory modality on information processing and retention (psychological modality effect, McGurk and Colavita effects), and modality-specific event-related potentials (ERPs) that perform similar cognitive functions (e.g., MMN and vMMN).

Understanding modality-specific language processing can shed light on the neural mechanisms of language comprehension, with implications for education, communication disorders, and assistive technologies. Therefore, our study investigates the existence of a neurophysiological modality effect in language processing.

Our research employs a multi-modal ERP paradigm to explore this effect in native language processing, testing two violation conditions: morphosyntactic and orthographic/phonological, representing varying levels of sensory modality dependency. Auditory ERPs are time-locked to the onset of the violated syllable to account for temporal differences between auditory and visual information availability. Eighteen native Spanish-speaking participants read and listened to Spanish sentences with subject-verb agreement violations and orthographic/phonological violations.

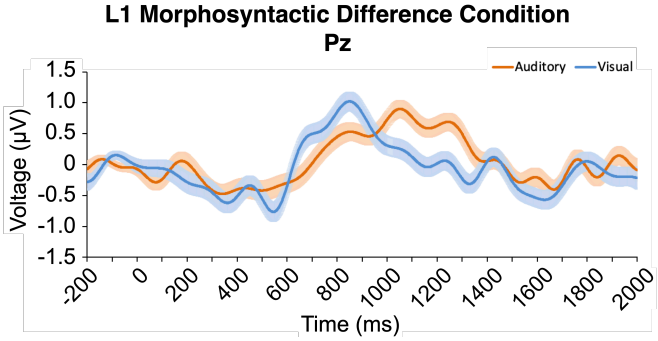

Figure 1: Morphosyntactic violation difference waveform (morphosyntactic violation minus control) showing the N400 and P600 in both modalities over Pz. For display purposes, the waveform is plotted with a low-pass filter at 6 Hz.

Our findings reveal neurophysiological modality effects in language processing in both violation conditions. Notably, the N400 is modality-independent, while the auditory P600 exhibits a more gradual and prolonged positivity than the visual P600 (Figure 1) in both violation conditions. In the orthographic/phonological violation condition, modality-specific effects are observed even during the N400 time window (across different regions), indicating heightened modality-specificity in orthographic and phonological processing. We additionally observed greater visual-evoked occipital negativity and greater auditory-evoked left frontotemporal negativity in both conditions, though varying in latency and distribution.

In conclusion, our results provide evidence for a combination of modality-dependent and -independent processes in language comprehension even post-sensory perception. We propose that while the N400 is modality-independent, the process(es) indexed by the P600 are partially modality-dependent and may include error backpropagation down to the representation level (which could explain how individuals adapt to variant pronunciations and handwriting styles). Taken together, these findings introduce of new perspective on the role that stimulus modality plays in language processing.

INVOLVEMENT OF PERCEPTUAL AND ACTION IN CHINESE CONCEPTS UNDERSTANDING

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Abstract: The theory of Embodied Cognition postulates a tight link between concepts and the embodied experience in the real world. In recent years, numerous studies have examined how sensory and/or motor experiences are involved in understanding concepts across different languages. However, such studies have primarily concentrated on alphabetic languages, with little evidence of the logographic language Chinese. The present study examined how sensory and action experiences are involved in understanding Chinese concepts. 209 adults of Chinese natives were asked to rate the degree of involvement of the six perceptual modalities (auditory, gustatory, haptic, interoceptive, olfactory, and visual) and five action effectors (Foot/leg, Hand/arm, Head, Mouth/throat, and Torso) in understanding Chinese concepts. The present study has identified visual, auditory, and olfactory as dominant dimensions of Chinese concepts according to the rating scores. There are close relationships between perceptual modalities and action effectors. Rating scores of olfactory are lower compared to the visual scores, but the ratings of olfactory and visual are positively correlated. Head action is a key action effector, and it is positively correlated with auditory. The research findings indicate the utility of both perceptual and action strength in facilitating concept development in Chinese. The above results add evidence to the embodiment of language processing.

Keywords: Embodied Cognition; vocabulary rating; sensory; motor;

TACKLING TALKER VARIABILITY IN SECOND LANGUAGE SPEECH PERCEPTION: THE ROLE OF LEXICAL FREQUENCY AND INDIVIDUAL DIFFERENCES

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Accurately perceiving non-native speech sounds is a major challenge for second language (L2) learners. Previous studies have identified several factors affecting L2 speech perception, including cross-linguistic influence, age, length of residence, and orthographic effects. Despite this line of research, there is still a need for further investigation of factors related to auditory input. The present study aims to investigate the influence of talker variability and lexical frequency on L2 speech perception, and how these factors interact with individual differences, including working memory, L2 receptive vocabulary knowledge, and L2 proficiency.

To this end, 120 Korean learners of English participated in a series of experiments. Using 28 English words (14 minimal pairs) of varying lexical frequency, the current study targeted the /i/-/ɪ/ vowel contrast in English, which is notoriously difficult for Korean learners of English. Each participant was assigned to one of three AX discrimination tasks (i.e., 40 participants per task). These tasks involved 336 target trials using the same 28 words, presented by 2, 6, or 12 different talkers. Participants also completed forward and backward digit span tasks to measure their working memory capacity and the Lexical Test for Advanced Learners of English (LexTALE) to measure their receptive vocabulary knowledge. Their general English proficiency was assessed using their Test of English for International Communication (TOEIC) scores. Forty-seven native speakers of English also participated in the study as baseline participants.

Results revealed that individuals with higher working memory were better able to discriminate between the two target vowels in the 12-talker condition, suggesting that working memory helps non-native listeners cope with variability in speech. The results also indicated an interplay between working memory and L2 proficiency as well as between working memory and L2 vocabulary size in the discrimination of the non-native vowel contrast. Specifically, proficient L2 learners with higher working memory were less affected by talker variability, while those with lower working memory were significantly impacted by it. This pattern also held for L2 vocabulary size, with only those with low working memory being influenced by talker variability, especially in the 12-talker condition, regardless of their L2 vocabulary size. These findings suggest that individuals with higher working memory, combined with higher L2 proficiency and larger L2 vocabulary size, were better able to overcome talker variability and discriminate between the target vowels more accurately.

Overall, the present study highlights the importance of working memory capacity in L2 speech perception and the role it plays in overcoming the variability induced by multiple talkers. It also emphasizes the interplay between working memory, L2 proficiency, and L2 vocabulary size, showing that a combination of these factors is necessary for effective L2 speech perception. The current study has important implications for L2 speech learning and provides a useful empirical foundation for individualized L2 pronunciation training.

THE CONTRASTIVE ANALYSIS OF ONLINE MEDIA REPRESENTATION OF MIGRANTS IN GREAT BRITAIN AS COMPARED TO RUSSIA.

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Today due to digitalization and rapid growth of network content it's of vital importance that linguistic methods should be adjusted for Big Data analysis. Another pressing challenge is increasing migration. This study aims to reveal the way migrants are represented in on-line media, in particular the lexical semantics of voice units denoting the concept "migrant" in British and Russian media texts and its contrastive analysis.

The database researched includes 7 400 passages (199 190 words) of English Internet corpus and Russian social media data of 8,478,629 characters (number of entries 16,738).

We implement cross disciplinary approach and apply the following methods: sentiment analysis; analysis of word associations using neural network technology (TextAnalyst 2.0); text analysis (TextAnalyst 2.0).

The results of the study suggest that in Russian media texts the dominant feature of the concept "migrant" is ethnicity. The word "migrant" is used in neutral connotation messages and texts with negative connotation. In Russian social networks messages, there is a focus on cultural differences and values. In English media texts the concept of "migrant" gains a negative connotation in contexts mentioning increase in the number of illegal migrants. Colloquial and vernacular vocabulary was noted in both datasets as well as expressive syntax and polysemy with the meaning of disapproval. The study also shows that due to its specifics the analysis of social media text requires implementation of new algorithms and methods of cross-disciplinary research.

INHIBITORY CONTROL IN BILINGUALS: TESTING THE ADAPTIVE CONTROL HYPOTHESIS

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The Adaptive Control Hypothesis (Green & Abutalebi, 2013) connects 'bilingual advantage' with interactional contexts of bilinguals. As per the theory, there are three possible interactional contexts in terms of language switching patterns of bilinguals: the Single language context (SLC), the Dual language context (DLC) and the Dense code-switching contexts (DCS), out of which Dual language context trains the cognitive control mechanism the most, thereby predicting a spill-over effect. The current study tests this claim in the context of India, and its young generation. A series of three experiments were carried out on bilingual participants, who differed in terms of their interactional contexts. A questionnaire adapted from (Hartanto & Yang, 2020) was used to categorize the participants as belonging to one of the three interactional context groups, followed by a series of three experiments, representing a particular aspect of domain general cognitive control: the inhibitory control. The experiments were: Simon, Stroop and Go/No Go task.

In the Simon task, the participants (N= 61; SLC:21, DLC: 19, DCS: 21) age range: 18-35 years (m= 28.90, SD= 3.45) responded to the given stimulus, ignoring its position on the screen. The hypothesis was that the Dual language context group would outperform the Single and Dense code-switching groups in this task requiring inhibitory control. Results however, showed that the Single language context group outperformed the other two groups in this task.

In order to investigate the matter further, the next experiments enlisted a larger group (N= 107; SLC: 47, DLC: 31, DCS: 29) of young adults, narrowing the age bracket (age range: 18-25, m= 19.45, SD= 1.26), They took part in two different inhibitory control tasks. The first was the classic Stroop task, where the participants had to ignore the word displayed on the screen and focus instead on the colour of the text. The second task was the Go/No-go task, in which the participant has to respond to one stimulus and refrain from responding to the other stimulus. Analysis shows that the participants of the Dense code-switching group outperformed the Single and the Dual language context groups in these two inhibitory control tasks.

The results in all three experiments failed to prove the hypothesis. The dual code switching group did not perform better than the other two groups. Though this is an ongoing study and further analysis are underway, the results point to further nuances in the 'bilingual experience' that probably needs attention. This study focussed on young adults, who are engineering students of a premier institute of India (IIT). Factors like intelligence, education, SES were controlled and thus can be excluded as confounding variables. Hence, more factors, alongside the language switching practice, probably are at play and that needs further investigation.

The production of formulae by Chinese children with Autism Spectrum Disorder

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Reference may be accomplished through proper names, nouns, and noun phrases ('marriage ring'), or through linguistic units associated with socio-cultural schemas ("'*I do*' ring"). Such kind of fixed linguistic units or unanalyzed chunks are typified as formulae. In adult language, these ritualized formulae are mostly used for humor (Pascual 2006, Pascual et al. 2013), but they show a wider occurrence and functionality in early child speech (Nelson 1973; Plunkett 1990; Hickey 1993), which has been supported as an alternative to develop language for young children. Children with Autism Spectrum Disorder (ASD) may also use socio-cultural emblems ('*Happy birthday!*') to refer to an entity associated with it (e.g., a birthday cake, Dobbinson et al. 2003; Pascual et al., 2017; Dornelas, 2018).

The main research question to address is: How do Chinese children with ASD manage to communicate with limited language resources, by using formulae functionally? To study the production of formulae by children with ASD, we designed a Naming-Reference task, involving 24 images: 12 professionals (a doctor) and 12 objects (a birthday cake), commonly associated with conventionalized meaningful fixed expressions. The questions posed were: 'What's/Who's this?' and 'What's it used for?'/'What does s/he do?'. The participants were 63 3-to-6-year-old Chinese children with ASD, dividing into high-verbal vs. low-verbal groups.

We explore the frequency and functions, as well as prevalence of formulae in children with ASD, to further understand the linguistic features of formulaic expressions produced by children with ASD. In addition, we investigate the relations between linguistic ability (i.e., expressive vocabulary size and sentence complexity assessed via standardized tests) and formula production by comparing the performance of high-verbal and low-verbal ASD children.

The results reveal that the majority of verbal formulae (~90%) produced by both high-verbal and low-verbal groups are ritualized linguistic units associated with the target images. It seems that children with ASD store whole social scenes related to the referents in the lexicon, with formulae forming a salient part of them. Additionally, a strong positive correlation was found between the production of formulae and general language ability (ps<.001), indicating that formulae may be a sign of language development in ASD, instead of a pathological default.

Keywords: Verbal formulae; Communicative strategy; Chinese children with Autism Spectrum Disorder; Elicitation; Reference

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HOW MUCH INFORMATION IS ENOUGH FOR THE PHONEMIC RESTORATION TO OCCUR? EVIDENCE FROM MANDARIN CHINESE

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Abstract *There is a consensus among researchers that speech perception utilises both bottom-up and top-down mechanisms (Caron, 1992). The phenomenon of phonemic restoration (PhR) is robust evidence for the utilisation of the top-down process in speech perception and is commonly observed in everyday speech communication. The PhR is defined as: when a speech segment is substituted by another sound, listeners still report the utterance as being intact because their brains perceptually restore the missing speech (Samuel, 1996).*

Although previous studies have suggested that linguistic units of the missing speech sounds (consonant, vowel, and syllable) and the amount of semantic information lost in relation to the meaning of the whole word may impact the PhR effect, the effects of these factors and the potential interaction effects have not been examined systematically. Specifically, most prior studies did not manipulate linguistic units but instead used noise generators to induce interruption to a continuous speech with only a few exceptions (Samuel, 1981; Warren, 1970; Warren & Obusek, 1970), leading to the question that they blurred how much information is needed to restore missing phonemes.

The present research, therefore, took advantage of the unique morpho-syllabic structures of Mandarin Chinese, which enabled researchers to manipulate the listening materials on the phonemic level and weigh their corresponding semantic meanings simultaneously, and investigated whether 1) masking different linguistic units of speech sounds, and 2) the morphological structure of Chinese words lead to different PhR effects, and 3) whether there is an interaction effect between these two factors on the PhR effect.

18 participants were recruited to complete a phonemic restoration task following the discrimination paradigm. In the experiment, participants were asked to discriminate between noise-superimposed items and noise-replacing items. On each item, either a consonant, a vowel or a syllable was masked or replaced. The data (participants' error rates) was subjected to ANOVAs. The results showed that the types of linguistic units being masked led to different PhR effects: masking consonants resulting in the strongest effect, whereas masking syllables leading to the weakest effect. Importantly, the effect of masked linguistic units was qualified by its interaction with the amount of missing semantic information. That is, the PhR effect was stronger in the one-morpheme word condition than in the two-morpheme word condition if a vowel was masked. The same trend was not observed for consonant or syllable conditions.

The present study is the first to examine the PhR effect using Mandarin Chinese and provides fine-grained evidence that the PhR effect is a function of the missing information and the remaining information at the word level. We discuss the implications of our findings for the existing theories on the PhR effect. The occurrence of the PhR when a consonant is masked is consistent with the existing findings that consonants share striking similarity in acoustic properties with noise (Samuel, 1981), and typically have much shorter durations compared to vowels, thus the acoustic cues provided by consonants initially appear redundant for listeners' perception (Wang & Chen, 2021). Furthermore, the significant effect of the morphological structure on the PhR when a vowel was masked enriches the current theories in that it revealed the difference in the amount of missing semantic information carried by a vowel would predict significantly different possibilities for the occurrence of the PhR, thus suggesting a threshold at which the remaining information can be considered "sufficient" for listeners to generate the intact perception.

FREQUENCY EFFECTS IN THE LEXICAL ACCESS THAT INVOLVES PHONOLOGICAL ALTERNATION: EVIDENCE FROM MANDARIN TONE 3 SANDHI

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Mandarin tone 3 sandhi refers to the phonological alternation of which a tone 3 (T3; a dipping tone) syllable changes to a tone 2 (T2; a rising tone) when followed by another T3. In a Mandarin disyllabic word composed of two T3 morphemes, T3 sandhi creates a mismatch between the phonological realizations at the morphemic- and word-levels, such that the initial syllable is underlyingly a T3 at the morphemic level (e.g., *hai* /T3/ 'sea') but realized as a T2 in the disyllabic word (e.g., *hai-zao* /T3-T3/→[T2-T3] 'seaweed'). Using frequency effect as a diagnostic tool, we conducted two cross-modal lexical decision priming tasks to investigate the influence of the two-level tonal deviation on the representation and access of Mandarin T3 sandhi. Both experiments used disyllabic sandhi words as visual targets (e.g., *hai-zao* 'seaweed') and monosyllabic T1 (control; *hai* [T1]), T2 (surface-overlapping; *hai* [T2]) or T3 (underlying-overlapping; *hai* [T3]) as audio primes.

Experiment 1 (N=33) used a total of 45 target sandhi words varying in the frequencies of the initial (sandhi-undergoing) characters and words. Condition 1 consisted of high-frequency words with a high-frequency initial character (e.g., *li-jie* 'comprehend'); Condition 2 contained low-frequency words with a high-frequency initial character (e.g., *hai-zao* 'seaweed'); for words in Condition 3, the frequencies of both the initial character and the whole word were low (e.g., *bu-ru* 'breastfeed'). The results showed distinctive priming patterns across conditions: for low-frequency sandhi words containing a high-frequency character (i.e., Condition 2), only the T3 prime showed a significant facilitation compared with the control prime (β=-0.062, t=-3.691, p<0.001), whereas for target words of which both morphemic and lexical frequencies were low (i.e., Condition 3), only the T2 prime showed a significant facilitation (β=-0.031, t=-2.003, p<0.05). These results showed how the frequencies (and dominance) of two morphological levels are associated with the underlying and surface tones of T3 sandhi words.

Experiment 2 (N=35) investigated the role of two-level tonal competition in the access of T3 sandhi by operationalizing the relative frequency of the initial T3 character's realization as a sandhi T2—we referred to this effect as "sandhi rate". A total of 36 sandhi words were used as targets, with the minimal sandhi rate being 0.02, i.e., *bian-sun* /T3-T3/ 'derogate' and the maximal rate reaching 1, i.e., *di-hui* /T3-T3/ 'defame'. Our results showed an interaction between sandhi rate and prime tones: higher sandhi rates facilitate the recognition of sandhi words in general, but the T3, not T2, prime exhibits a significantly different slope relative to the control prime (β=0.067, t=2.272, p<0.05). We posit that it is because the more frequently the initial T3 character surfaces as a sandhi variant, the more strongly the sandhi word is represented as /T2-T3/, hence the easier it is to directly access the surface form; however, the saliency of the surface tone cannot easily override the strong availability of the underlying form /T3-T3/; thus, when the prime is a T3 audio, sandhi rate showed no effect. Results of Experiment 2 further support our postulation on the role of the two-level tonal competition in the access of T3 sandhi words, indicating that native speakers can utilize the distributional properties of the morphemes and the associated tonal forms to internalize the deviation.

Taken together, our study demonstrates the availability of both the underlying and surface tones in processing T3 sandhi. The way language users internalize the competition between the underlying and surface phonological forms exhibits a parallel to morphological processing, pointing to a multi-level lexical access model where individual morphemes, the whole word itself, and the phonological forms associated with each morphological level all play a role and compete with each other in the mental lexicon.

MINIMAL RELATIONS LEAD TO SUPERIOR MEMORY

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Introduction The interweaving between memory and language gives rise to two intriguing phenomena: (1) when scrambled words are organized into grammatically-licit sequences, our memory capacity is dramatically enhanced (i.e., Sentence Superiority Effect, SSE, e.g., Baddeley et al., 2009; Bonhage et al., 2014). (2) our memory for language is not verbatim (e.g., Bransford et al., 1972) indicating that a format transformation en route to memory. While these two phenomena are well-documented, it remains mysterious why memory benefits from syntactic sequences and how linguistic information is stored in memory.

Syntax constructs linguistic units such as phrases and sentences and establishes relations among individual words. The established relations enable sentences to describe causal, temporal, and spatial relations among objects. For example, in the phrases like "*a book on a cup*" and "*fox's bag*", the individual objects (*book* and *cup*, *fox* and *bag*) are bound by spatial and possessive relation respectively.

This study explores a hypothesis that between-object relations are a critical factor for memory. In four experiments with English and Chinese participants, we examined whether the presence of minimal relations between objects leads to better memory performance.

Methods All experiments followed the 2×2 within-subject design with the independent variables: *TYPE (Phrase vs. Word-pair) and TEST (Immediate vs. Delayed)*. Phrases are constructed by introducing the *spatial* (e.g., Exp 1: "*a cup on a book*", Exp 2: "*杯子上的课本*") or *possessive* relation (e.g., Exp 3: "*fox's bag*", Exp 4: "*狐狸的书包*") between two items. Participants were instructed to listen to a sequence of either four phrases or four word-pairs and then perform a written free recall task immediately or after completing a distractor task.

Results The key results (Fig 1) revealed that a better memory performance for phrases vs word-pairs was found, suggesting that memory favours complex objects (created via a relation of simple ones) over lists of unrelated objects.

Discussion The observed superior memory suggests that memory was facilitated by the introduction of minimal relations between the two individual objects. Syntax, represented by prepositions or possessive marker, plays a crucial role in establishing and conveying conceptual relations. The establishment of relations allows linguistic units that are larger than words, such as phrases and sentences, to describe and store entities as holistic units, which may more naturally fit into the memory data structures compared to unstructured word sequences.

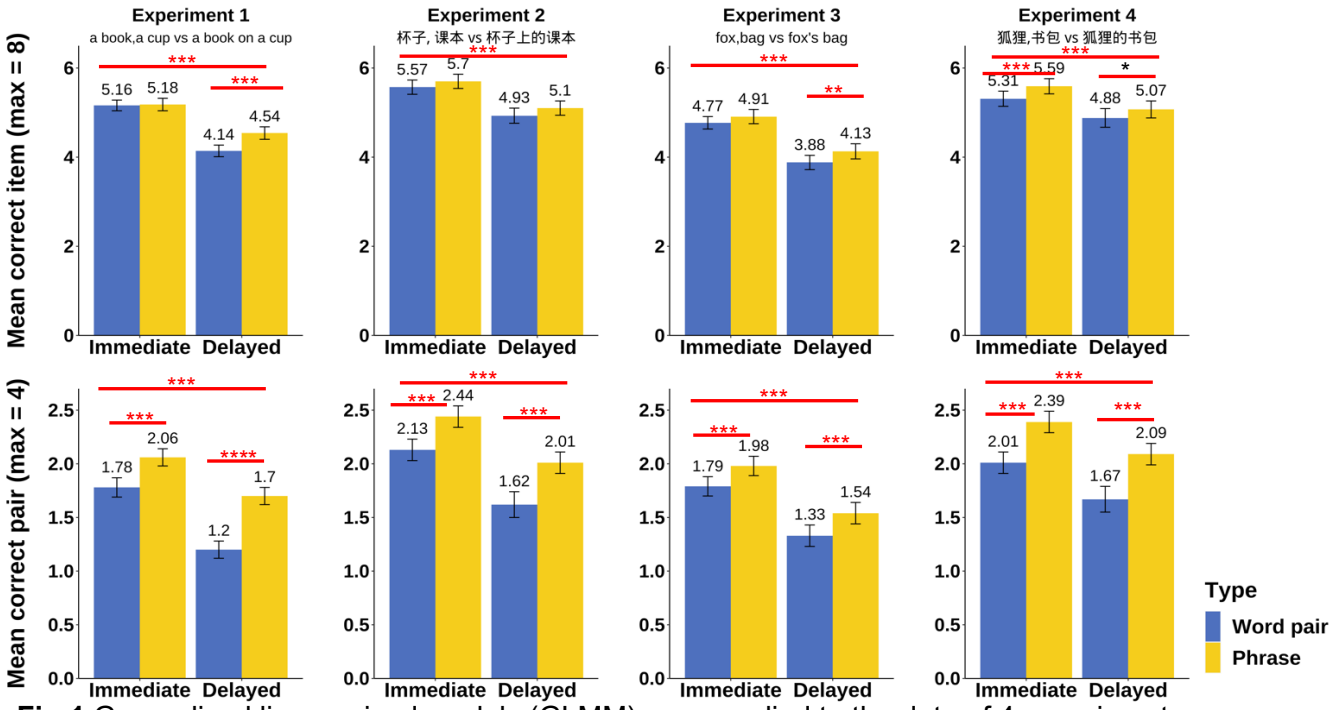

Fig 1 Generalized linear mixed models (GLMM) were applied to the data of 4 experiments.

REFLEXIVE REFERENCE RESOLUTION IN MANDARIN: AN EYE-TRACKING STUDY

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Introduction: Despite the general impression that reflexives like *himself* predominantly obey Chomskyan locality condition[1,2], Mandarin complex reflexive *ta-ziji* is more liberal to long-distance binding (LDB)[3,4]. A LDB reflexive could be modulated by discourse factors such as logophoricity (logo) and as such termed a *logophor* associated with the center of consciousness/perspective[5]. Previous research[6,7] has looked into syntax-discourse interface in processing reflexives, but not in the context of *ta-ziji*. In this project, we examine how syntax-discourse factors affect the processing of Mandarin complex reflexive *ta-ziji* by manipulating logo contexts and *forced* (non)local bindings, using the timing-sensitive eye-tracking paradigm.

Design & Predictions: Here we report a 2x2 design (32 experimental stimuli per subject) as shown in the Table for our inquiry, in which we leave out the control groups (2x2) where the relative clause part is replaced by *ta-ziji* due to space limits. Culy's[8] logophoricity hierarchy of predicates is the basis to manipulate the logo factor, according to which we use *say* and its variants for the high logo condition (**H**) and *see* and its variants for lowness (**L**). Matrix verbs like *say* create a high logo context for the reflexive in its domain to be bound by the (long-distance) matrix subject. Binding effect is modulated by the post-reflexive disambiguating verb (V3) that s-selects its subject and thus forces local or distant binding (**Loc** vs. **Dist**). For the eye-tracking data, we focus on those reflecting a range of processing stages: initial processing (Gaze duration, **Gaze;** first-pass integration (Regression path duration), **RPD**; Rereading time, **RRT**, i.e., **RPD-Gaze**), and late processing measurements (Second-pass duration; **SPD**, i.e., Total reading time-**Gaze**). The high logo is expected to create a competition with the default local antecedent in and/or after the ***Reflexive*** region, causing longer reading time (RT). In the ***V3*** disambiguating region, we anticipate a binding effect in late integration stages, where a local antecedent forced by the verb causes shorter RT as it conforms with locality.

Results and Discussion: The eye-tracking data from 100 valid subjects were analyzed using linear mixed-effects regression models, with maximal random effects constructed unless their presence is vacuous in model comparisons. The results show that: (1) a main effect of logo is observed (**H>L**) in the post-reflexive spillover region ***Adv*** w.r.t. **Gaze** (t(961.6)=-2.883, p=.004), with longer Gaze in high logo contexts. This suggests that logo plays a significant role in the early processing stage of *ta-ziji* that it competes with the default local preference. (2) Also at ***Adv*** region, an interaction effect is observed w.r.t. **RPD** (t(915.8)=-2.067, p=.039) and **RRT** (t(967.8)=-2.477, p=.013), most plausibly to reflect the effect of parafoveally previewing the following verb ***V3***. The interaction suggests that logo has a stronger effect when the semantics of the verb forces a nonlocal antecedent thus causes longer RT in **H-Dist**, indicating that the competition between local/nonlocal binding is escalated in **H-Dist** compared with **L-Dist** as more semantic factors in the former compete with locality. (3) no main effect of locality in ***V3*** found anywhere, suggesting that binding effect does not strongly predict first-pass/late integration ease, indicating that local and nonlocal binding are most likely equally competitive. Note that in this project, we assume that *ta-ziji* inherently prefers a local binding and as such still find that semantic-pragmatic factors like logophoricity compete with locality even in early processing stages. We are also in progress of follow-up experiments using *ziji* to compare if the competition disappears when the locality requirement becomes weaker[2].

Table. Sample stimulus*

Condition (Logo-Locality)					***Reflexive***	***Adv***	***V3*** *Disambiguating*		
H-Loc	護工 hùgōng carer	說 shuō say	醫生 yīshēng doctor	幫助了 bāngzhùle help	他自己 tā-zìjǐ him-self	今天 jīntiān today	診治 zhěnzhì diagnose	的 de DE	患者。 huànzhě patient
H-Dist	醫生 yīshēng		護工 hùgōng						
L-Loc	護工 hùgōng	看到 kàndào see	醫生 yīshēng						
L-DIst	醫生 yīshēng		護工 hùgōng						

English translation:
"The {**carer**/doctor$_i$} {said/saw} that the {**doctor**/carer$_i$} helped a patient whom he himself$_{i/*j}$ diagnosed today."
NB: *diagnose* s-selects for *the doctor* as its subject and the sole binder of the reflexive.

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LOST IN TRANSITION: LANGUAGE ACQUISITION IN CHILDREN AND MACHINES

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Background: The current study tested whether children and a large language model can acquire syntactically complex sentences, as shown in (1)–(4), whose grammaticality contrast involve a learnability challenge in language acquisition: The contrast at issue is not learnable solely through input, due to the scarcity of ungrammatical sentences like (2) and (3) in the input data (e.g., Zukowski & Larsen, 2011). Using a psycholinguistic experiment and computational modeling, this study provides new insights into the persistent discussions regarding the role of innate versus input-driven mechanisms in language acquisition.

(1) Who + Gap: *I wonder who you wanna work with*.
(2) *Who + No gap: **I wonder who you wanna work*.
(3) *If + Gap: **I wonder if you wanna work with.*
(4) If + No gap: *I wonder if you wanna work*.

Method: The stimuli comprised 20 target sentences (e.g., (1)–(4)), which were distributed in a 2 x 2 Latin square design with the factors *Clause* (Who vs. If) and *Gap* (Gap vs. No gap), alongside 48 fillers. Human ratings for these sentences were obtained through an acceptability judgment task, where 70 adults (as a control group) and 39 children (age: 3–7) rated each sentence on a four-point Likert scale. For the large language model's acceptability ratings, log probability calculations were performed using the API of Generative Pre-trained Transformer (GPT) 3.5 (i.e., text-davinci-003).

Results (Figure 1): Three linear mixed-effects regression models were fitted to each of the adults' *z*-transformed acceptability scores, the children's *z*-transformed acceptability scores, and the GPT 3.5's *z*-transformed log probability scores, with *Clause* and *Gap* as fixed effects as well as *participant* (adult and child data only) and *item* as random effects. All three models showed a significant *Clause*-by-*Gap* interaction (all *p*s < .001). Post-hoc analyses for the three datasets displayed a higher acceptance rate for If + No gap than *If + Gap (all *p*s < .001). However, only in the adult and child datasets, did the analyses reveal a higher acceptance rate for Who + Gap than for *Who + No gap (all *p*s < .001); and such a difference was absent in GPT 3.5 (*p* > .1). A further individual analysis showed that children as young as the age of 3;11, like adults, had the target grammaticality contrast.

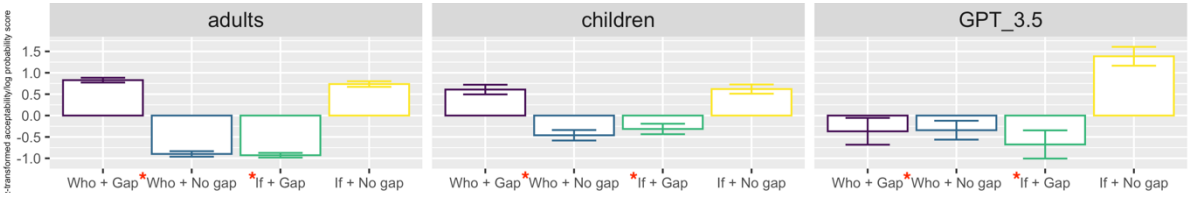

Figure 1. Mean *z*-transformed acceptability/log probability scores per condition and dataset

Discussion: A clear divide between the acceptability ratings of adults and children, on the one hand, and the log probability scores of GPT 3.5, on the other, indicates that whereas children can successfully acquire the subtle grammaticality contrast, up-to-date large language models have difficulties in inducing human-like grammatical knowledge. In light of the debates on language acquisition mechanisms, our findings seem to align with the position that the acquisition of sophisticated grammatical knowledge is not possible through statistical learning from input data alone (e.g., Chomsky, 1965).

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BILINGUAL EXPOSURE DOES NOT IMPEDE CANTONESE-ENGLISH BILINGUAL AUTISTIC CHILDREN'S RECEPTIVE VOCABULARY IN L1 CANTONESE

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While bilingualism has been convincingly demonstrated in language development with typically developing (TD) children, its impact on autistic children has not been systematically studied in autistic children (Howlin, 2004). Autism professionals and parents believe two languages would increase the burden on autistic children (Yu, 2013). Empirical support or rejection is lacking for this belief. Due to the increasing number of bilingual children and the prevalence of autism spectrum disorder (ASD), it is crucial to understand the relationship between bilingualism and ASD. This study examined the effects of bilingual exposure on Cantonese-English bilingual autistic children's receptive vocabulary in their L1 Cantonese. Using the Cantonese Receptive Vocabulary Test (CRVT; Cheung et al., 1997), we tested receptive Cantonese vocabulary knowledge in 5 to 6-year-old bilingual autistic children (N=20) and bilingual TD peers (N=41) matched in age, working memory, and parents' education level. Both groups of children were dominant in Cantonese and had acquired Cantonese as L1 and English as L2. The nonverbal IQ of autistic children was significantly lower than that of TD children. We measured the children's total number of Cantonese and English exposure hours in the home, school, and community. Correlation and hierarchical regression analyses were conducted in R separately for the two groups to examine the relationship between children's receptive vocabulary scores and bilingual exposure. The results showed that autistic children scored significantly lower than their TD peers in CRVT (t = -3.1493, p = 0.003), and received significantly less English exposure at home and community than TD children. Autistic children's performance in CRVT did not significantly correlate with Cantonese exposure (r = 0.052, p = 0.827) or English exposure (r = 0.153, p = 0.519). Although Cantonese exposure did not significantly correlate with TD children's receptive vocabulary scores, English exposure negatively correlated with those scores. The hierarchical regression analyses showed that only age resulted in a significant increase in variance accounted for (ΔR^2 = 0.715, p < 0.001) in autistic children, whereas working memory (ΔR^2 = 0.124, p = 0.033), parental education level (ΔR^2 = 0.090, p = 0.046) and English exposure (ΔR^2 = 0.106, p = 0.023) yielded a significant increase in variance accounted for among TD children. While autistic children's receptive vocabulary lagged behind those of age-matched TD children, autistic children were not affected by the same factors influencing TD children's receptive vocabulary performance. More importantly, the findings indicate that bilingual exposure does not impede autistic children's performance in L1 receptive vocabulary. The findings of this study will help to inform evidence-based practice and provide essential guidance to parents and professionals regarding autistic children in bilingual communities.

Keywords: bilingual children, Autism Spectrum Disorder, vocabulary, bilingual exposure

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INFLUENCE OF MUSICAL EXPERIENCE ON LANGUAGE LEARNERS' DISCRIMINATION OF JAPANESE PITCH ACCENT: EVIDENCE FROM NARIVE SPEAKERS OF MANDARIN CHINSES

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Previous studies have demonstrated that both musical experience and tone language experience enhance the encoding of speech sounds. Nonetheless, their combination effects on pitch perception are not well studied. The current study aims to investigates whether musical experience has additive values on Japanese pitch perception among native speakers of Mandarin Chinese.

64 participants, including 32 musicians (have five or more years of systematic formal musical experience, have high proficiency in playing a musical instrument, and received continuous musical experience recently) and 32 non-musicians (have not received any systematic musical experience previously, have no experience of playing any musical instrument) who did not have any prior experience of learning Japanese, were recruited from a local university. Participants completed working memory capacity task, musical pitch perception task, musical rhythm perception task, and Japanese pitch perception task. Their performance was calculated using accuracy rates. We examined group differences, the relationships between musical perception and Japanese pitch perception, and the prediction of Japanese pitch perception.

Two-tailed independent *t*-tests showed that there was no significant difference in the working memory capacity and musical pitch perception between musicians and non-musicians. However, a marginal significant group difference was found on the musical rhythm perception task, t (62) = 2.00, p = .050, *Cohen's d* = .50. As for the Japanese discrimination task, musicians had higher accuracy rates than non-musicians, t (62) = 3.76, p < .001, *Cohen's d* = .94. We also found that Japanese pitch perception was positively correlated with musical pitch perception, r = .37, p = .002, and musical rhythm perception, r = .32, p = .009. Additionally, we conducted multiple linear regression models with musicianship (musician vs. non-musicians), musical ability (musical pitch perception, musical rhythm perception), working memory capacity, and demographic variables (gender, age, family SES) as predictors while the accuracy rates of Japanese pitch perception as the outcome variable. We found that only musicianship significantly predicts accuracy rates of the Japanese pitch perception after FDR correction of multiple comparisons. Post-hoc comparison suggests that musicians (M = .94 ± .01) had higher marginal means of accuracy rates than non-musicians (M = .89 ± .01, p = .008).

Our findings suggest that long-term musical experience may have additive effects on pitch perception among tone language speakers. Our findings are consistent with theoretical accounts of the shared mechanism and cumulative role of musical experience in language learning.

CLASSIFIERS AND CATEGORIZATION OF OBJECTS BY NATIVE AND NONNATIVE SPEAKERS OF CHINESE

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Abstract:

The impact of classifier categories on object concepts has always been an enlightening research topic to explore the relations between language and concept. Though previous findings were controversial, recent studies suggested that classifier system may not affect conceptual organization so much as assumed. However, the typical experimental tasks adopted in these studies, such as the Categorization match task or the Similarity task, could not exclude the possible influence from the inherent similarity among stimuli. This study used a modified Categorization match task to investigate whether a language featured by numeral classifiers affects conceptual structure of speakers. With the manipulated stimuli, which would not present distinctly similar or different features to the extent that they can be easily identified, a questionnaire booklet containing 22 triads of objects was constructed, each consisting of the target, classifier item and control item. The study tested two groups of participants, 25 native speakers of Mandarin (a classifier language) and 25 native speakers of English (a language without classifiers), with the booklet in their language version respectively. The results from two versions of match task show that there was no significant difference ($p=0.188$) between two groups on the overall rate of classifier item choice and thus no significant effect of language here. Speakers of English chose slightly more same-classifier items (52.55%) than control items. However, the opposite was true for speakers of Chinese, with slightly less same-classifier choices (48%) than control ones. The findings could verify that two groups might not organize their object concepts in drastically different ways. Moreover, this study indicates that, speakers of a classifier language are not more sensitive to the organization of classifier categories than speakers of a non-classifier language. The seemingly counter-intuitive phenomenon, which is somewhat different to key previous findings, is discussed.

Keywords:

classifiers; object concepts; categorization; linguistic relativity

ON THE USE OF IMPLICIT CAUSALITY INFORMATION IN ENGLISH PRONOUN ANAPHORIC INFERENCE: EVIDENCE FROM CHINESE SECOND LANGUAGE LEARNERS' EYE MOVEMENTS

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Introduction: Implicit causality is a well-known phenomenon where verbs supply information about the potential cause of the behavior or state to one of the antecedents (e.g., "*Mary praised David because*..." would continue about David, not Mary) (Garvey & Caramazza, 1974). The activation time of implicit causality information in pronoun anaphoric inference is still in dispute, and two accounts have been proposed: the focusing account (McKoon et al., 1993; Greene & McKoon, 1995; Long & De Ley, 2000; Koornneef & Van Berkum, 2006) and the integration account (Garnham et al., 1996; Stewart et al., 2000).

Aims and Objects: The present investigation is designed to explore whether and when Chinese English learners make use of verb-based implicit causality information in making English pronoun anaphoric inference, and whether language proficiency has an effect on this process.

Methodology: A normal sentence reading eye movement experiment (N=83) is conducted with verb bias (NP1 vs. NP2), congruency (congruent vs. incongruent) and language proficiency (high vs. low) being manipulated. Materials are constructed with the "NP1 + V-ed + NP2 + because + he/she..." structure.

Data and Analysis: Area of interests are the critical pronoun (he/she) and the critical region because he/she). The eye movement measures include first fixation durations, first gaze durations, regression path durations and total reading times. Linear mixed effects model with verb bias, congruency and language proficiency as fixed effects and subjects and items as random effects is fitted to every eye movement measure in each area of interests.

Findings and Conclusions: Results demonstrate that Chinese English learners can activate verb-based implicit causality information at an early time, before the disambiguating information appeared, and high proficiency level learners take less time to make pronoun anaphoric inference than low proficiency level learners. These findings suggest that Chinese English learners succeed in using verb-based implicit causality information in making pronoun anaphoric inference and language proficiency can also influence this process, which supports the focusing account.

Keywords: implicit causality; anaphoric inference; language proficiency

An example of the stimuli used in this experiment.

(a) NP1-biased verb, bias-congruent pronoun

John annoyed Mary because he kept making the same mistake while practicing.

(b) NP1-biased verb, bias-incongruent pronoun

Mary annoyed John because he hated people talking about his past life.

(c) NP2-biased verb, bias-congruent pronoun

John admired Mary because she could speak six foreign languages at a young age.

(d) NP2-biased verb, bias-incongruent pronoun

Mary admired John because she liked people with exploration and innovation spirit.

THE INFLUENCE OF WORD PREDICTABILITY ON CHARACTER CONSISTENCY EFFECT WHEN READING CHINESE SENTENCES

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The present study examined the effects of character consistency and word predictability on the Chinese lexical recognition process during natural reading. Chinese character consistency refers to the degree of orthography-to-phonology consistency in pronunciation among a group of characters that share the same phonetic radical. Previous studies had showed the consistency effect in naming and lexical decision tasks with isolated word presentation. The evidence of that high-consistency characters are named faster and more accurately than low-consistency characters suggests the involvement of phonological recoding during Chinese lexical processing. However, most reading materials in daily life are in the form of sentences. The eye-tracking studies of sentence reading have shown the influence of context on word recognition. Predictable words had shorter fixation times and higher skip rates than unpredictable words. It is the aim of the present study to investigate whether the contextual constraint for Chinese words would affect the orthography-to-phonology consistency processing of their constituted characters.

One experiment was conducted to manipulate the first character's consistency (high vs. low) of Chinese two-character word and its predictability (predictable vs. unpredictable) from the preceding sentence context. The target words were all low frequency words. In the experiment, 40 participants read 80 sentences and their eye movements were recorded. The results showed both the consistency and word predictability effects on gazed duration of target words. The consistency effect was in line with the previous studies demonstrating Chinese phonological processing at the sub-lexical level in the sentence reading task. The word predictability effect was also consistent with the literatures suggesting early involvement of contextual processing for Chinese word recognition. There was no interaction effect between consistency and word predictability. However, the consistency effect on gaze duration and refixation rate was marginal significant for unpredictable words but not for predictable words. A supplemental analysis was conducted to include word frequency as the third variable in the statistical models. The results showed a reliable word frequency effect and its interaction with consistency and word predictability, even the target words were all low frequency with a mean of 3.59 per million words. Moreover, the consistency effect was significant on gaze duration for unpredictable words but not for predictable words when the data of the relative high frequency words were excluded. The findings of the present experiment suggest an early influence of the contextual information on sub-lexical processing of word recognition when word frequency was taken into account.

EYE MOVEMENT OF PRESCHOOLERS WITH AUTISM SPECTRUM DISORDER IN PICTURE BOOK READING

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We divided 75 children with ASD into three groups based on their reading profiles: children with hyperlexia (ASD+HP, N = 32), children with average listening comprehension and decoding skills (ASD+AV, N=18), and children with below average listening comprehension and decoding skills (ASD+BAV, N = 25). We also recruited a group of 31 typically developing children. Then, we compared their eye-gazing at pictures and prints during picture book reading between the four groups. For prints, we created three conditions in the picture book, namely, pages with real characters, pages with pseudo characters, and pages with non-characters, to explore the four groups' eye gazing under the three conditions. Children in the four groups are matched on age and the character recognition of ASD+HP group is comparable to that of TD group. With IQ and AQ controlled, the two-way mixed MANCOVA showed that compared with TD, ASD+AV, ASD+BAV groups, children with ASD+HP paid more attention to characters than pictures. For the three conditions, the gazing durations of children with ASD+HP on real and pseudo characters were not significant, but their gazing duration on non-characters was significantly less than the other two conditions, suggesting the role of orthographic awareness in Chinese character recognition of children with ASD+HP.

THE EFFECT OF EMOTIONAL CONTENT AND LANGUAGE ON WORKING MEMORY

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Research has shown the effect of emotional content on working memory (WM) performance in L1, though the findings remain controversial. Besides, given that a lower emotional intensity of the second language was found compared to the native language, we assumed a reduced effect of emotional content on bilinguals' L2 WM performance than L1. Therefore, our study not only examined the effect of emotional content on WM performance, but also investigated whether the effect would be modulated by the nativeness of the language (L1 and L2).

48 two-syllable English words (16 for positive, negative, and neutral words respectively) were selected from the database of Affective Norms for English Words (Bradley & Lang, 1999), and were translated into two-syllable Chinese counterparts. Bilinguals (n=21, L1-Chinese, L2-English) were asked to do the English 3-back WM tasks three times for each type of word with intervals, and native speakers (n=21, L1-Chinese) were asked to do the Chinese 3-back WM tasks following the same procedure.

Results showed differential effects of negative and positive content. Negative content resulted in a decreased accuracy in verbal WM tasks when compared to neutral content ($F(1, 40) = 4.906$, $p < 0.05$); in contrast, positive content did not show an effect when compared to neutral content (Figure 1). These results support the negativity bias (stronger effect of negative than positive information) and the emotional impairment hypothesis (emotional content impairing rather than enhancing WM performance). Moreover, language did not modulate the effect of emotional content on WM performance, which suggests that near-native encoding of emotional content might be achieved. The impairment effect of the negative content implies that negative verbal information captures more processing resources and disrupts the active maintenance of other information.

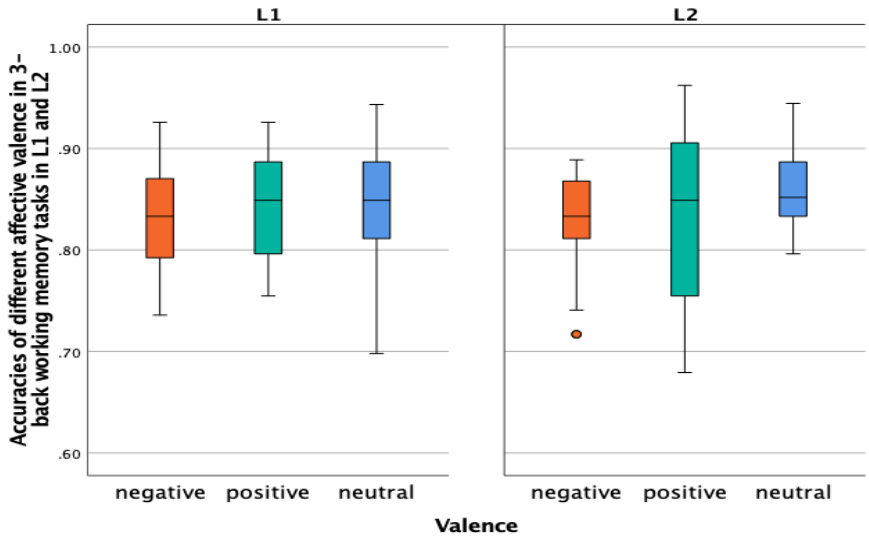

Figure 1. Accuracies of different affective valence in 3-back WM tasks in L1 and L2

TOPIC-PROMINENT FEATURE DISTRIBUTIONS IN CHINESE TEXTBOOKS

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While English sentences are centred around the subject, Chinese sentences are argued to focus more on the topic[1] (thematic meaning). Several topic-prominent features (e.g., subject omission) are suggested to be more common in Chinese than English[2, 3]. However, these suggestions are based on subjectively selected sentence examples, which may not represent how these features are objectively distributed in contemporary Chinese[2, 3, 4].

The current study examined the distributions of four key topic-prominent features in articles taught in textbooks (grade 7-12) in mainland China[5]. The features included subject switching (SW; switching subjects in a sentence), double subject (DS; two consecutive subjects), flexible passive construction (fPC; passives without a *be*-passive structure), and subject omission (SO).

Preliminary analyses show that SW, fPC, and SO are more common in original Chinese articles (N=8; SW:41.84%, fPC:14.18%, SO:25.53%) than in Chinese articles translated from English (N=3; SW:14.63%, fPC:6.10%, SO:4.88%) and their source English articles (N=3; SW:13.55%, fPC:0%, SO:3.08%). DS was found to be uncommon across all article types.
These results confirm that some but not all topic-prominent features are differentially distributed in Chinese vs. English, demonstrating that objective analysis of feature distributions in corpuses can make meaningful contributions to the debate. Further researches will then focus on how these different feature distributions are represented in the brain from different aspects.

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DO ERP INDICES OF RATIONAL INFERENCE IN REAL-TIME COMPREHENSION TRACK THE NOISE RATE IN THE ENVIRONMENT?

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Introduction According to the Noisy-Channel framework [1,2], the communication process involves noise (e.g., speaker errors, mishearing, noisy environment) and comprehenders rationally infer the intended meaning given imperfect input. In offline tasks, inference about non-literal interpretations is sensitive to statistical patterns in the linguistic environment [1, 2, 3]. Comprehenders are more likely to arrive at a non-literal interpretation when there is a possible intended message that is likely to be distorted into the received message; and (ii) the perceived noise rate of the communicative environment is higher, and this inference adapts rapidly to the rate and characteristics of noise in the environment [3]. In online real-time processing, the N400 and P600 ERP components seem to index the probability of noisy-channel inference. When an implausible continuation is orthographically close to a more plausible alternative, an increased P600 and decreased N400 are observed [4, 5]. If this view of P600 is correct, then it should also adapt rapidly to the noise rate of the linguistic environment in online rational inference. The current study replicates and extends [4] to investigate whether N400 and P600 effect sizes are modulated by the noise rate by manipulating the proportion of errors in non-critical exposure sentences. Data collection is ongoing (planned N = 48).

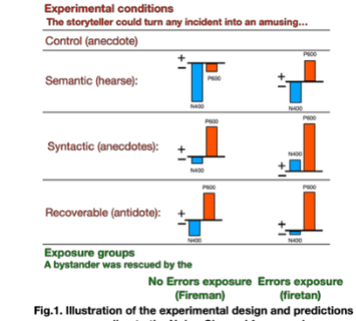

Fig.1. Illustration of the experimental design and predictions according to the Noisy-Channel framework

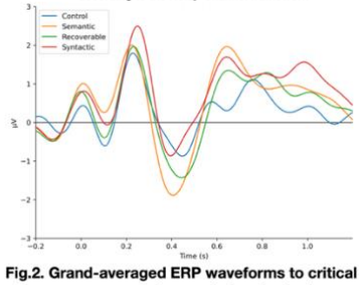

Fig.2. Grand-averaged ERP waveforms to critical nouns across centro-posterior electrodes.

Experimental Design We crossed error type conditions (within-subjects) with exposure groups (between-subjects) (Fig. 1). **Error type:** In the *semantic* condition, the last word is semantically implausible (e.g. The storyteller could turn any incident into an amusing hearse); in the *syntactic* condition it contains a *syntactic* error (e.g. anecdotes). In the *recoverable* condition, it is semantically anomalous but orthographically close (as measured by Levenshtein distance) to a semantically plausible neighbor (e.g. antidote). The errors in *syntactic* and *recoverable* conditions are both recoverable via a noisy-channel inference and expected to elicit a P600. **Exposure:** We also manipulated the rate of errors that comprehenders are exposed to. In the *Errors* exposure group, exposure sentences contain blatant typographical errors (e.g. A bystander was rescued by the firetan). In the *No Errors* exposure group, exposure sentences did not contain errors.

Materials We adapted stimuli from [4]. There are 640 experimental sentences with 160 in each condition. There are 40 exposure sentences for each group, in addition to 280 plausible filler sentences. All sentences are distributed into 8 lists following a Latin Square design, and the orders are randomized. Comprehenders are asked to read sentences presented word by word while EEG signals are recorded.

Analysis We analyze mean N400 (300-500ms post-onset) and P600 (600-800ms) amplitudes elicited by critical words over fifteen centro-parietal electrodes. We analyze the results in a linear mixed effect model: *Amplitude ~ Condition * Exposure + (1+Condition | subject) + (1+Condition*Exposure | item) + (1+Condition*Exposure | electrode)*

Predictions and Preliminary results We expect to replicate [4], where semantic and recoverable conditions elicited N400 effects, and syntactic and recoverable conditions elicited P600 effects (see Fig1-left). Critically, the Noisy-Channel framework predicts an interaction between exposure and conditions: The N400 effect in critical conditions (*semantic*, *recoverable*) will be greater when the noise rate is lower (*No Errors* exposure group), whereas P600 effects (in *syntactic* and *recoverable* conditions) will be greater when the noise rate is higher (*Errors* exposure group) (Fig1-right). In our preliminary analysis (N=16), we collapsed data from both exposure groups and replicated a significant N400 effect to semantic violations (t = -2.03*) and a near significant P600 effect to syntactic violations (t = 2.11, p = 0.06). Comparison between exposure groups is forthcoming.

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IS THE ROLE OF ONOMATOPOEIA IN CHILDREN'S EARLY LANGUAGE DEVELOPMENT TIME-SENSITIVE?

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Onomatopoeia, which depicts sounds in nature and follows phonological rules, is a specific linguistic phenomenon. It plays a crucial role in children's early language development, as they acquire the ability to recognize sound segments. Onomatopoeia engages both visual and auditory modes, helping children establish connections between referents and the phonological system. This, in turn, promotes vocabulary learning and enhances listening comprehension, as suggested by the Sound Symbolism Bootstrapping Hypothesis (Imai et al., 2004). However, as children grow older and become more familiar with conventional words, the significance of onomatopoeia in language development may diminish. Therefore, to gain a comprehensive understanding of onomatopoeia processing in children's language development, it is essential to compare different age groups separately. In light of this, our study focused on examining the role of onomatopoeia recognition in Chinese vocabulary knowledge and listening comprehension among 119 Chinese children, divided into younger (average age: 47.41 months) and older cohorts (average age: 73.88 months), with the age cutoff set at five years (60 months). The participants were asked to complete a researcher-developed onomatopoeia recognition test, where they had to judge whether the onomatopoeia representation matched the corresponding image. Both accuracy and response time were recorded using E-prime 2.0. Given that Chinese onomatopoeia often appears in the reduplicated bi-syllabic form, its recognition may require meta-linguistic awareness. Additionally, this study included tests for Chinese morphological and phonological awareness, as well as vocabulary knowledge (conventional words) and listening comprehension. After controlling for age, non-verbal intelligence, and metalinguistic awareness, the hierarchical regression analysis yielded that onomatopoeia recognition emerged as a significant predictor of vocabulary knowledge solely in the younger cohort. However, in the older cohort, a surprising negative relationship was observed between onomatopoeia recognition and listening comprehension. Furthermore, the correlation between onomatopoeia and meta-linguistic awareness exhibited an interesting shift. In the younger cohort, this correlation was limited to morphological awareness, whereas in the older cohort, it extended to both phonological and morphological awareness. These results suggest that as children mature, the role of onomatopoeia in their language development may diminish. However, it is worth noting that onomatopoeia continues to play a crucial role in fostering the comprehensive development of meta-linguistic awareness.

THE ROLES OF L2 NATIVELIKENESS AND COGNITIVE RESOURCES IN THE GENERALIZATION OF L2 PHONETIC CONVERGENCE

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Phonetic convergence is the process whereby speakers' phonetic features become more similar to those of their conversation partners. While some studies propose that phonetic convergence is largely automatic, achieving nativelike pronunciation in a second language (L2) is challenging. To explore how phonetic convergence relates to L2 phonetic learning, this study examined the generalization of convergence and the extent to which nativelikeness in L2 pronunciation and cognitive resources influenced the degree of generalization.

We recruited 88 Chinese-English bilinguals who underwent a "pretest-exposure-posttest" paradigm. They read aloud two English word lists (i.e., an exposure list and a new list) in the pretest, listened to a native English speaker producing the exposure list during the exposure phase, and read both lists again in the posttest. The target vowels /ɪ/ and /ɒ/ were present in words from both lists (i.e., for each vowel, 20 words were selected in the exposure list and 10 in the new list). Phonetic convergence was measured by comparing participants' posttest vowel production to that of the native speaker, while controlling for their pretest production. L2 nativelikeness was determined by the acoustic distances between participants' pretest vowel productions and those of the native speaker, while cognitive resources were assessed using participants' phonological memory span.

The first and second formants (F1 and F2) of the target vowels in participants' productions were extracted and analyzed using linear mixed-effects modeling. The results showed that participants converged towards the native speaker in both formant values during the posttest. Furthermore, the converged features generalized to new words containing the target vowels in the F2, even though these words were not presented during the exposure phase. The extent of generalization in the F2 was influenced by both L2 nativelikeness and phonological memory span. Specifically, participants with less nativelike L2 production exhibited greater generalization; individuals with larger memory spans demonstrated stronger phonetic convergence, particularly among those with less nativelike production compared to those with more nativelike production.

This study contributes to the understanding of the generalization of L2 phonetic convergence. It supports the claim that L2 phonetic convergence is less automatic than L1 convergence and highlights the role of cognitive resources for L2 speakers with less nativelike production. The findings have implications for L2 pronunciation training.

DEVELOPING A COMPUTER ASSISTED NOTE-TAKING ANALYSIS SYSTEM (CANA) FOR QUANTIFYING FEATURES OF CONSECUTIVE INTERPRETERS' NOTES

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Abstract：Note-taking features (representing corresponding note-taking techniques) have been the focus of the study of note-taking in consecutive interpreting. However, the coding and quantifying of note-taking features have been done manually up to date, without an effective tool available to researchers, which has constrained the quantitative empirical research of note-taking. Therefore, this study developed a Computer Assisted Note-taking Analysis system (CANA) for the coding and quantifying of features of interpreters' notes. After three rounds of testing and debugging, CANA was applied to the coding of 709 pages (containing 44,360 note units) of interpreters' notes. Results showed that CANA was easy to learn and use, and offered virtually all the operations necessary for the coding and quantification of note-taking features. With the assistance of CANA, the speed of coding was improved by about four times. CANA was thus verified as an effective tool for quantifying interpreters' note-taking features. CANA could be applied to the research, learning and teaching of note-taking for consecutive interpreting. This study also shed light on the future building of a corpus of interpreters' notes.

Key words: interpreters' note-taking; note-taking features; computer assisted; CANA; category coding; note corpora

SPEAKER-ORIENTED ADVERBS *EXPECTEDLY* IMPACT REFLEXIVE RESOLUTION IN CHINESE

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Introduction Linguistic research (e.g., Speas'04) shows that speaker-oriented adverbs can express the attitude, judgment, and knowledge of the attitude holder about the proposition or event described by the subordinate clause (e.g., *John said that, as expected, Mary …*). These adverbs typically convey the ***point of view*** or ***perspective*** of the attitude holder (e.g., *John*). Our study tests whether and how speaker-oriented adverbs expressing the attitude holder's perspective impact reflexive resolution in Chinese. We look at the perspective-sensitive *ziji* ('self') and the controversial *ta-ziji* ('s/he-self') which is typically assumed to be perspective-insensitive. The results from two antecedent choice judgment experiments and a self-paced reading experiment show that speaker-oriented adverbs impact the interpretation of *ziji* and *ta-ziji*, which suggests that *both* reflexives can be perspective-sensitive. However, this impact only 'kicks in' very late, when we consider the combined results from these three experiments.

Methods Exp. 1 (N = 50) and **Exp. 2** (N = 53) are **antecedent choice judgment** experiments and used the same materials. However, Experiment 1 is a two-alternative forced choice task while Experiment 2 added a third choice, 'Ambiguous'. The factors REFLEXIVE (*ziji*/*ta-ziji*) and ADVERB (speaker-neutral/-oriented) were controlled (see (1)). Speaker-neutral adverbs (e.g., 'last week') are neutral regarding from whose perspective an event is evaluated; speaker-oriented adverbs bias the perspective of the attitude holder (e.g., *non-local* subject *Xiaoli*).

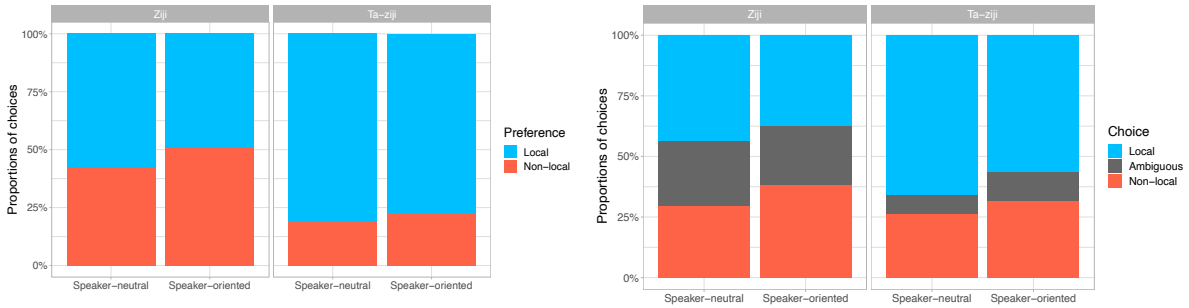
(1) Xiaoli$_{fem}$ say Xiaofang$_{fem}$ {last-week/expectedly} BA *ziji*/*ta-ziji* DE that-CL paper make-lost.

Exp. 3 (N = 52) is a **self-paced reading** experiment probing whether/when speaker-oriented adverbs impact the interpretation of *ta-ziji*. The factors ANTECEDENT (local/non-local) and ADVERB (speaker-neutral/-oriented) were controlled (see (2)). The distance of the **antecedent** is determined by the gender match between *ta$_{fem/mal}$-ziji* and the (non-)local antecedent (e.g., *Xiaoli$_{fem}$*/*Qianjun$_{mal}$*). The critical region is the reflexive *ta-ziji*. In Exp. 3, participants also made sentence-final decisions about who the antecedent is (e.g., 'whose paper was made lost?").

(2) a. Xiaoli$_{fem}$ say **Qianjun$_{mal}$** {last-week/expectedly} BA **ta$_{mal}$-ziji** DE … (Local binding)
b. **Xiaoli$_{fem}$** say Qianjun$_{mal}$ {last-week/expectedly} BA **ta$_{fem}$-ziji** DE … (Non-local binding)

We used mixed effects logistic models to analyze antecedent choices and the mixed effects linear models to analyze reading times (RTs).

Antecedent choices As shown below, when the sentence has a speaker-oriented adverb, Chinese speakers are more likely to accept the non-local attitude holder as the antecedent. This ADVERB effect is only significant for *ziji* in **Exp. 1** ($p < 0.05$), despite a similar pattern for *ta-ziji*, which in fact reaches significance ($p < 0.05$) in **Exp. 2** ($p < 0.05$) with three choices.



Reading times (RTs) and sentence-final judgment Due to space, the main findings of **Exp. 3** are that, starting from the post-critical region *DE*, non-local binding in (2b) causes longer RTs than local binding in (2a) (ps < 0.05). The ADVERB effect is not significant. But strikingly, the sentence-final judgment (binary choice) data in Exp. 3 show a very similar pattern to Exp. 1: within the **non-local conditions (2b)**, participants are more likely to accept non-local binding with a speaker-oriented adverb (56%) than with a speaker-neutral adverb (48%) ($p < 0.05$). Combined, this suggests that speaker-oriented adverbs have a delayed effect for *ta-ziji*.

EXTRACTION OUT OF MANDARIN CLAUSES: TOPIC VS. FOCUS

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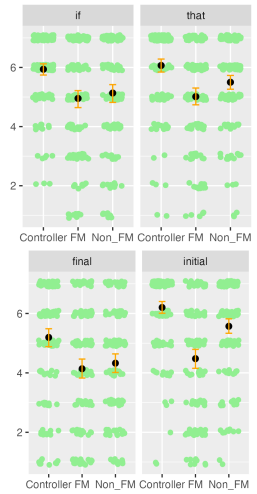
One main issue in linguistic theory is constraints on long-distance dependencies (Ross, 1967). Adjunct clauses are supposed to block extraction (Huang, 1982). **Method**: Two Mandarin acceptability judgment experiments were conducted on IBEX. Exp1 crossed Focus-Status(Focus/Topic) and If-Clause-Position (Initial/Final). Exp2 crossed Focus-Status(Focus/Topic) and Clause-Type(if/that clause). Mandarin natives (36 for Exp1; 37 for Exp2) read sentence pairs and rated the second sentence on a 1-7 Likert scale, followed by yes/no comprehension questions (threshold 80% accuracy rate). **Predictions:** Processing approach: shorter linear distance between the filler and the gap favors extraction out of in-initial adjuncts (Exp1), and predicts no differences between if-clauses and that-clauses (Exp2). Syntactic approach: higher structural distance with initial if-clauses might lower their acceptability in Exp1 (Haegeman,1994). Extractions from if-clauses should be rated worse than that-clauses in Exp2. Discourse approach: Exp1: Focus-Background Conflict Constraint (Abeillé et al., 2020) penalizes extraction of a focused element from a backgrounded constituent because there is a discourse conflict. If initial if-clauses are more backgrounded than final if-clauses, a bigger penalty for focusing out of initial if-clauses is predicted. For Exp2, a penalty for focus extraction out of if-clauses is predicted, if that-clauses are less backgrounded. **Results and Discussions:** Bayesian Analysis for **Exp1** shows a high probability for Focus-Marker effect (lower ratings in focused conditions), if-clause position effect (higher ratings in if-initial sentences), and an interaction (bigger difference between Focus and Topic in if-initial sentence), supporting the discourse approach. If-initial conditions showed significantly higher acceptability, which may be explained by shorter linear distance and frequency: Mandarin if-adverbial clauses usually precede matrix clauses, independently of whether they convey new/given information (Pan & Paul,2018). Results of **Exp2** show a high probability for FM effect (lower acceptability in focused conditions), no Clause-type effect and no interaction(no adjunct island). However, Mandarin if-clauses usually precede the matrix clauses, but if-clauses in Exp2 are if-final conditions, which may influence the results. Regarding the higher acceptability of non-FM extraction out of that-clauses, natives may interpret it as topic-comment structure. The obvious decrease in FM condition of that-clause (compared with non FM condition) may be because FM decreased the possibility of being interpreted as topic-comment structure.



Ref: [1]Abeillé et al., Cognition 2020; [2] Huang, Logical Relations in Chinese and the Theory of Grammar 1982; [3] Pan & Paul, The syntax of complex sentences in Mandarin Chinese 2018; [4] Ross,Constraints on Variables in Syntax,1967

Example items:

Exp1:(±Shi) zheben shu, ta hui feichang gaoxing, ruguo ta renzhen yuedu.
(±FM) this-CL book, he will very happy, if she carefully read
(±Shi) zheben shu, ruguo ta renzhen yuedu, ta hui feichang gaoxing.
(±FM) this-CL book, if she carefully read he will very happy

Exp2: (±Shi) zheben shu, ta feichang gaoxing ta renzhen yuedu le.
(±FM) this-CL book, he very happy she carefully read-ASP
(±Shi) zheben shu, ta hui feichang gaoxing, ruguo ta renzhen yuedu.
(±FM) this-CL book, he will very happy, if she carefully read

DIFFERENT TASKS MODULATE THE LOCALITY BIAS IN REFLEXIVE RESOLUTION IN MANDARIN

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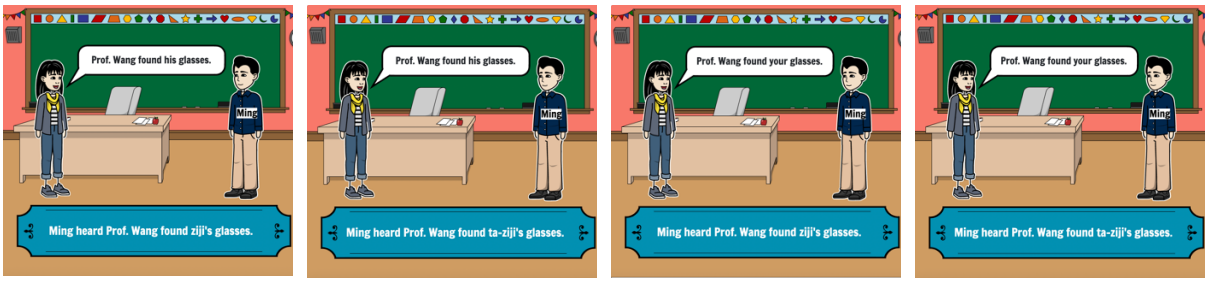
Introduction Most experimental studies on the interpretation of Mandarin reflexives *ziji* ('self') and *ta-ziji* ('pronoun-self') using self-paced reading and acceptability judgment (e.g., Dillon et al.'14, 16'; Wang'17; Lyu & Kaiser'23) find that Mandarin speakers prefer local binding for both reflexives. This locality bias is often attributed to the activation of the structural locality constraint, as by default these reflexives are presumably analyzed as syntactic anaphors (e.g., syntax-first account). However, working memory factors such as the recency bias (distinct from the notion of structural locality) may play a highly prominent role in these text-only-based experiments. Thus, examining whether the structural locality bias for *ziji* and *ta-ziji* still exists using other types of experiments is important for (psycho-)linguistic research.

To foreground our conclusions, we discovered that Mandarin speakers prefer local binding for *ziji* and *ta-ziji* alike in the self-paced reading and acceptability judgment tasks but show divergent patterns in a picture-based truth value judgment task where *ziji* tends to be reserved for non-local use and *ta-ziji* tends to be used for local binding.

Methods The self-paced reading (Exp.1, 28 participants) and acceptability judgment (Exp.2, 42 participants) tasks used the same sentences (24 targets, fillers included for all experiments). We manipulated the animacy of the local/non-local antecedent to control the binding distance between the animate-compatible reflexive and its antecedent (see (1a-b)). In Exp.1, the critical region is *(ta-)ziji*-GEN.

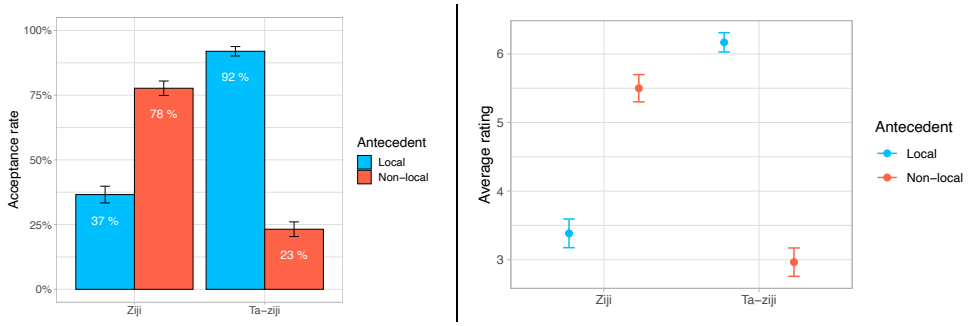
(1) a. Radio station say **journalist** reveal-ASP ***ziji/ta-ziji***-GEN interview purpose. (Local)
b. **Journalist** say radio station reveal-ASP ***ziji/ta-ziji***-GEN interview purpose. (Non-local)

In the picture-based truth value judgment task (Exp.3, 33 participants), participants judged (categorically and numerically) whether the statement below the scene (white text in blue box) is a correct or incorrect summary of the conversation. See (2) for one example (conversations transliterated to English) of the 16 target sets.



Conditions from left to right: local/*ziji*; local/*ta-ziji*; non-local/*ziji*; non-local/*ta-ziji*

Results For brevity, we report main findings. As expected, the self-paced reading study shows that participants prefer local binding, as (1b) leads to reading slowdowns ($p < 0.05$, *lmer* in R) at the final region (i.e., 'purpose.') for both reflexives. This locality/recency bias was replicated by the acceptability judgment study with the same stimuli (main effect of distance, $p < 0.05$). However, the picture-based truth value judgment task shows a different pattern (shown below), which suggests that *ziji* fits the non-local use better and *ta-ziji* has predominant local use.



(Left: proportions of TRUE answers; right: the higher the rating, the more TRUE the statement)

L1 CHINESE SPEAKERS' REAL-TIME LEXICAL-SEMANTIC PROCESSING OF CHINESE NEOLOGISMS COINED BY ENGLISH-SPEAKING L2 CHINESE LEARNERS

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Abstract

Chinese neological errors are deviant, non-existent lexical forms coined by English-speaking L2 learners with incomplete lexical knowledge (Xing, 2003). Wang (2018) has examined 4 types of Chinese neologisms coined by English-speaking L2ers, including morphological substitution (e.g. *内 边>里边, inside), blended misuse between word and morpheme (e.g. *花公园>花园, park), clipping by forming a non-existent word (*古楼>古代楼阁, ancient building), and existent structure but non-existent word (e.g. *比赛会>比赛, sport meeting). However, up-to-date studies have never investigated L1 Chinese speakers' processing of different types of neological errors coined by English-speaking L2 learners from a real-time psycholinguistic paradigm. Through examining processing time, we may infer L1 Chinese speakers' lexical-semantic processing difficulty of different neological types. The scholastic inquiry is presented as to whether L1 Chinese speakers' real-time processing times are significantly different for different neological types coined by L2 learners. The study recruited 90 native Mandarin participants with at least a secondary schooling background (age range: 18-22). They were required to complete a self-paced reading with 40 independent critical sentences (4 neological types×10=40 in total) and 40 fillers operative on PCIbex Farm, followed by answering a semantically related question after each sentence. All stimuli in each experiment were aligned with the Latin square design. Unexpectedly, contrary to the hypothesis that "forming non-existent words by clipping" might trigger the longest average processing time, "morphological substitution" incurred the longest period in both critical and post-critical regions on average (mathematically, not statistically). Furthermore, post hoc multiple comparisons of ANOVA (i.e. inferential statistics) substantiates that the participants' processing times were not significantly different between any two neological types, theoretically implying that L1 Chinese users were insensitive to between-type neological discrepancies despite manifesting a relative difference in processing time on average.

The most prominent, distinguishing feature of L1 Chinese users is their sound knowledge of word-morpheme boundary and efficient strategy to parse lexical and syntactic information. They automatically view words comprising morphemes as a holistic construction and comprehend meaning on a macroscopic, contextual level. Regardless of any neological type, L1 users apply the same principle and procedure to effectively figure out any uncertain lexical meaning. They closely engage with the syntactic environment and automatically predict semantically dubious segments. Once L1 users find a cue in either the pre-critical region or post-critical region to imply the possible meaning of a neologism, they tend to search their mental lexicon to confirm an orthographically similar item that also fits in the context. Ultimately, this logical chain well accounts for L1 Chinese speakers' null statistically significant timing and insensitivity among different neological types.

Day 2 Poster Presentations

December 2, 2023

STRUCTURAL AND SEMANTIC CUES IMPACT THE PROCESSING OF THE WEAK CROSSOVER CONSTRUCTION AT DIFFERENT STAGES: EVIDENCE FROM SELF-PACED READING

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Introduction This study examines when structural and semantic cues are accessed during pronoun resolution in the weak crossover (WCO) construction in English. In a WCO sentence, the *wh*-phrase (e.g., *which man*) moves across a non-c-commanding co-indexed pronoun, like *his* in (1a). In theoretical linguistics, it is often assumed that co-reference between *which man* and *his* in (1a) is not allowed due to structural constraints like the Bound Anaphor Condition (Reinhart'83). However, a prior study examining the real-time processing of pronouns in the WCO construction (Kush et al.'17) presented evidence that the semantic information/cue (gender) of the *wh*-phrase is quickly accessed, suggesting that the WCO constraint is weak. This study builds on prior work but adopts a different design that fully crosses the gender congruency of the structurally licit *and* illicit referents (see (1a-d)) to identify when structural and semantic cues modulate real-time processing.

Examples of the target stimuli (slashes mark different regions in self-paced reading):

(1a) TARGET MATCH/DISTRACTOR MATCH
Peter/ wondered/ which man/ in/ the office/ his/ supervisor/ had/ promoted/ recently.

(1b) TARGET MATCH/DISTRACTOR MISMATCH
Sarah/ wondered/ which man/ in/ the office/ her/ supervisor/ had/ promoted/ recently.

(1c) TARGET MISMATCH/DISTRACTOR MATCH
Sarah/ wondered/ which man/ in/ the office/ his/ supervisor/ had/ promoted/ recently.

(1d) TARGET MISMATCH/DISTRACTOR MISMATCH
Peter/ wondered/ which man/ in/ the office/ her/ supervisor/ had/ promoted/ recently.

To foreshadow the conclusions, our self-paced reading study shows that during pronoun resolution, there is no 'semantic intrusion' effect from a structurally illicit *wh*-phrase (e.g., *which man*); only the gender of the structurally licit referent (e.g., *Peter/Sarah*) plays a significant role. However, at the later processing stages, the gender cue of the *wh*-phrase does seem to modulate the processing patterns. This suggests that the WCO constraint – despite being violable at the later comprehension stages – is not violated at the early processing stages. The post-reading acceptability judgment also matches the overall reading time (RT) patterns.

Methodology Participants (N = 50) read sentences region by region. At the end of each trial, they judged how acceptable the sentence is on a 1-7 Likert scale. The gender congruencies of the TARGET (match/mismatch) and the DISTRACTOR (match/mismatch) were fully crossed in a 2x2 factorial design. The target refers to the structurally licit co-referent (e.g., *Peter*), while the distractor refers to the structurally illicit co-referent (e.g., *which man*). Following prior work (e.g., Sturt'03; Kush et al.'17), we take the *gender mismatch effect*, characterized by reading slowdowns when a pronoun and its target/distractor have different genders, as a diagnostic of whether readers attempt to establish coreferences. Mixed-effect linear models were used (*lme4* in R) for statistical analysis.

Results The critical region is the pronoun. No effects are significant prior to the first spillover region (e.g., *supervisor*) which shows only a main effect of TARGET mismatch effect (p < .001). This suggests that only the gender of the structurally licit target referent (e.g., *Peter/Sarah*) is accessible at this stage, while the gender of the distractor has no effect on pronoun resolution (p > .6).

At the final region (e.g., *recently*), within the target match conditions, distractor mismatch (1b) causes significant reading slowdowns (p < .05) compared to distractor match (1a), while the gender of the distractor has no effect within the target mismatch conditions (1c-d) (p > .2). In the post-reading acceptability judgment, we have similarly observed a *late-stage* marginal distractor gender mismatch effect (p = .08) within the target match conditions in (1a-b).

In sum, the results indicate that the semantic gender of the *distractor* has a limited impact on pronoun resolution until later stages of processing in the WCO construction in English.

THE EFFECT OF POLITENESS ON PRAGMATIC INFERENCING AND ITS TIME COURSE: A VISUAL-WORLD STUDY ON THE INTERPRETATION OF SCALAR TERMS IN INTERPERSONAL CONTEXTS

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In the recent decade, a growing body of research has been launched to investigate how scalar expressions like *some* and *or* are interpreted in contexts that involve interpersonal factors, especially those in which politeness concerns may arise (e.g., face-threatening contexts). Studies in this line of research have reached rather opposite conclusions with regard to the effect of politeness on the derivation of scalar implicatures (Bonnefon et al., 2009; Holtgraves et al., 2018; Mazzarella et al., 2018; Terkourafi et al., 2020).

Previous work investigates the effect of politeness mostly by manipulating face orientations via two methods, one based on semantics of predicates in scalar utterances and the other based on situational affect in contexts. We argue that both methods fail to create the expected difference in face orientations, thus making the comparison between the two contexts less informative. In fact, politeness concerns may be relevant in the two contexts, contra the implicit assumption that politeness concerns only arise in the face-threatening contexts. A critical consequence of this is that participants may take the scalar utterances to perform distinct illocutionary acts (i.e., illocutionary pluralism) (Lewinski, 2021; Johnson, 2019; Witek, 2015) even in the same context. Given the inherent connection between intention(ality) and illocutionary forces (e.g., Searle, 1969, 1975), it could be potentially productive to examine the effect of politeness by incorporating the role of illocutionary forces and their associated intentions. At the same time, given the problems in the manipulation of face orientations, the time course of such an effect largely remains unclear, even though the existing evidence seems to show a downstream effect.

To this end, the present study, working within the intention-based framework of pragmatic inferencing (Grice, 1967; Bach & Harnish, 1979; Bach, 2004; Jaszczolt, 2002; Levinson, 2000; Carston, 2002; Sperber & Wilson, 1995; Searle, 1969, 1975), reinvestigates the interpretation of scalar quantifiers of “yixie” (some) and “huozhe” (or) in contexts with politeness concerns by employing a visual-world paradigm. We create the contexts by manipulating both the situational affect and semantics of predicates while considering the social variables associated with interactants. We record participants’ eye movements during the unfolding of scalar utterances in the presence of visual displays. We also ask participants to indicate their perceived illocutionary forces associated with the scalar utterances. We then offer explanations for the mechanisms underlying this interpretive process. Our findings could contribute to the understanding of pragmatic inferencing mechanisms and shed light on how humans make interpretive decisions in conversational situations.

THE EFFECT OF DISCOURSE CONTEXTS ON CHINESE LEARNERS' ONLINE COMPREHENSION OF ENGLISH PSYCH CAUSATIVES

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English psych causative verbs (e.g. *satisfy)* are often stative psych verbs in Chinese (e.g. *manyi* / be satisfied with) and Chinese English learners found it hard to perceive the implicit causal meaning suggested by English psych lexical causative. Since language is used in contexts and should be learned in contexts (N. Ellis, 2006), we conducted three experiments (timed sentence comprehension and timed grammaticality judgement tasks) with psych lexical causative, investigating whether discourse contexts could facilitate L2 online processing of verb argument structures (VACs) with learning difficulties. **Experiment 1** (norming study) found that intermediate Chinese English learners (n=38) preferred psych analytical causatives (e.g. *The noise made the dancer annoyed*) to the typical psych lexical causative in English (e.g. *The noise*$_{\text{(Stimulus)}}$ *annoyed the dancer* $_{\textit{(Experiencer)}}$), while advanced learners (n=37) showed preference for psych lexical causatives as natives (n=29) did. When the Stimulus was animate entity, L2 subjects showed indeterminacy in deciding the Stimulus role, which was in line with previous findings (Zhang 2003; Chen 1996). In Experiment 2 and 3, we manipulated discourse contexts which may support the difficult thematic-syntactic mapping of psych lexical causative with animate Stimulus (*e.g.* ***The athlete annoyed the dancer***). Three discourse context conditions were devised, *Causal*, *Referent salience* and *Unrelated discourses*. **Causal discourse** sentences offered a cause for the target psych causative sentence (*e.g. An athlete smoked in the dancer's room*). ***Referent salience* discourses** were devised by negating the causal discourses, removing the causal events but leaving the Stimulus role salient as the topic/agent in discourse contexts (*e.g. An athlete didn't smoke in the dancer's room*). In **Experiment 2**, intermediate (n=41) and advanced (n=36) Chinese English learners and English natives (n=36) comprehended 72 target sentences with animate Stimulus in discourse contexts under time pressure. Results found facilitative effects of discourses with *causal cue* and *role salience cue* on intermediate learners' processing speed and comprehension accuracy with psych lexical causatives, but no such effects were found with advanced learners and English natives. Additionally, we found that the role salient cue in the referent salience discourses in Exp2 might be confounded by the causal scenario suggested by the content words (e.g. *smoke, in the room*) (Otten, 2007). To specify the effects of different discourse factors, we conducted **Experiment 3** with another group of intermediate learners (n=41) from the same participant pool and a native control group(n=36). Advanced group was not recruited due to their similar performance as English natives in Experiment 2. In Exp. 3, the *Referent salient* discourses were rewritten to include no content word indicating a cause for the target sentence (e.g. ***An athlete lived a mile away from the dancer***). Similarly, causal, role salience and unrelated discourses were arranged. The results showed that the c*ausal discourses*, but not merely the salient role facilitated L2 learners' accuracy with psych lexical causatives. The current study indicated that 1) supportive discourses would facilitate online thematic-syntactic mapping of difficult L2 VAC; 2) the richer information the discourses offer, the more effective they would be; 3) when learners acquired the structure, discourse effects may disappear.

GRAMMATICAL ENCODING FOR COMMUNICATIVE EFFICIENCY – EVIDENCE FROM THE PRODUCTION OF ORC AND PASSIVE-SRC IN CHINESE

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Speakers tailor their utterances for addressees, as evidenced in studies on word production and articulation (Ferreira, 2019). While evidence for audience design during grammatical encoding of sentence production is limited (Morgan & Ferreira, 2022), studies on morphosyntactic encoding, such as Kurumada and Jaeger (2015), suggest that it may occur. In Chinese, passive-SRCs and ORCs have similar meanings, pragmatic functions, and word order, but differ with respect to the passive marker *bei* (passive-SRC: *bei*$_{passive\text{-}marker}$ *agent V de*$_{RC\text{-}marker}$ *patient*; ORC: *agent V de*$_{RC\text{-}marker}$ *patient*). The *bei* marker signals to listeners that the following discourse is transitive and can reduce temporary syntactic ambiguity (the beginning of an ORC may be interpreted as a main clause temporarily). A comparison of the contexts in which both structures can occur offers a unique opportunity to investigate syntactic audience design in sentence production. To explore this, we conducted one production and comprehension experiment.

In the production experiment, 30 participants were given pictures showing either one or two transitive events (e.g., in Condition A, a picture showed *a skinny tourist on the left and a chubby tourist that is being bitten by a dog on the right*; in Condition B, a picture showed *a cat that bites a skinny tourist on the left, and a dog that bites a chubby tourist on the right*; 20 items per condition). The task was to produce a response to questions yielding relative clauses (e.g., Q: *Which tourist is chubbier;* A: *The one that the dog bites/ the one that is bitten by the dog*). In Condition A, participants produced more passive-SRCs than in Condition B. Given that Chinese speakers prefer to produce passive-SRCs over ORCs in isolated contexts – possibly due to *bei* in SRCs providing more time to formulate content and reduce semantic interference (Hsiao & MacDonald, 2016), the asymmetry of syntactic choices between conditions in our experiment cannot be attributed to production ease alone. However, our findings can be explained by syntactic audience design as a factor for syntactic choice. The transitivity-predictive feature of the *bei* marker in passive-SRC can reveal to potential addressees that a transitive event is about to be expressed, aiding them in quickly identifying the target event (e.g., *The dog bites the chubby tourist*) in contexts with a single transitive event, whereas this cue does not help in contexts with two transitive events. To investigate whether the *bei* marker indeed has this aiding effect, we conducted a visual world comprehension experiment.

Using the same pictures from the production experiment, we asked another 32 Mandarin participants to identify the referent mentioned as the head noun in pre-recorded RCs (passive-SRC, ORC) as quickly as possible while monitoring gaze. We found that only in one transitive event contexts, the passive-SRC (compared to ORC) facilitated identification, resulting in faster reaction times (using agent-onset as the reference point) and more frequent gaze towards the target picture at agent-onset. These results support our interpretation of the production experiment and suggest that speakers tend to select syntactic structures depending on the informativeness of these structures as they unfold in real-time depending on specific contexts, which suggests that syntactic choice is to some extent driven by communicative efficiency.

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Kurumada, C., & Jaeger, T. F. (2015). Communicative efficiency in language production: Optional case-marking in Japanese. *Journal of Memory and Language, 83*, 152-178.

Morgan, A. M., & Ferreira, V. S. (2022). Still no evidence for audience design in syntax: Resumptive pronouns are not the exception. *Journal of Memory and Language, 127*.

SYNTACTIC PREDICTION IN CHINESE-ENGLISH BILINGUALS: EVIDENCE FROM *EITHER/HUÒZHĚ*

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Language users can predict the upcoming information during comprehension. It remains unclear, however, whether bilingual and second language (L2) speakers could predict to the same extent as native speakers do. Up till now, most studies have focused on lexico-semantic prediction, comparing L2 speakers with first language (L1) speakers. These studies have yielded conflicting results (see Kaan & Gruter, 2021, for a review).

In the current study, we reexamined whether bilinguals can predict upcoming syntactic information similarly in their L1 and L2 using a within-participants design. In a self-paced reading experiment, we explored whether C-E bilinguals could predict the upcoming conjunction "or/huòzhě" upon encountering the sentence-initial "either/huòzhě" in both English and Chinese. Sixty-four intermediate to advanced C-E bilinguals (mean age=21.3, *SD*=2.9) were paid to participate. They were randomly assigned to one of four lists, yielded by crossing experimental conditions ("either/huòzhě" vs. no "either/huòzhě") with language (English vs. Chinese). Each list contained 32 critical sentences and 96 fillers of unrelated structures. Half of the critical and filler sentences were in Chinese and half in English. Within each list, the Chinese and English sentences were presented in two separate blocks, with the presentation order (Chinese first vs. English first) counterbalanced across lists. Sentences were read in a word-by-word, self-paced moving window display.

The prediction effect was based on measuring participants' RTs on sentences like (1-2). For each item, we analyzed RTs on the *or*/*huòzhě* NP region (e.g., *or John* in 1*, huòzhě péngyou* in 2), the immediately preceding NP (*a cake, fángzi*), and the two following words (*will make; jiègěi, le*). For multi-word regions, RTs were summed across the words in that region.

(1) [*Either*]*Peter will bake a cake or John will make some cookies*

(2) ［或者］小李 卖掉 了*房子 或者 朋友* 借给 了 他 钱。

[*Either*] Xiao Li sell LE (Perfective) house or friend lend LE him money

Trans: [*Either*] Xiao Li sold the house or his friend lent him money.

Data were analyzed with linear mixed-effect regression models. Raw RTs were log-transformed for statistical modeling. The critical predictors were the presence of "either/huòzhě" and language (L1 vs. L2). All categorical predictors were centered using contrast coding. The results showed that at the critical *or*/*huòzhě* NP region, the effect of "either/huòzhě" was significant, *b*=-0.043, *SE*=0.012, *t*=-3.698, *p*=.000, indicating that participants read faster when "either/huòzhě" was present. The effect of language was also significant, *b*=-0.593, *SE*=0.012, *t*=-50.840, *p*=.000, indicating that participants read Chinese faster than English. Crucially, the interaction between "either/huòzhě" and language was not significant, *b*=0.038, *SE*=0.023, *t*=1.611, *p*=.107, indicating that syntactic prediction in the L1 and L2 didn't significantly differ from each other.

Our findings suggest that at the syntactic level, bilinguals can predict to a similar extent in the L2 as in the L1, supporting the view that the mechanisms underlying L1 and L2 sentence processing are fundamentally the same (Kaan, 2014).

UNLOCKING COGNITIVE POTENTIAL: THE IMPACT OF SHORT-TERM SECOND LANGUAGE TRAINING ON EXECUTIVE FUNCTION IN LOW-INCOME PRIMARY STUDENTS IN CHINA

Lihua Xia (Huazhong University of Science and Technology) & Adam John Privitera (Nanyang Technological University)

Differences in executive functions significantly impact on a wide range of outcomes. It is generally accepted that the developmental trajectory of executive functions can be modulated through experience. One such experience that has garnered significant attention is bilingualism. Growing evidence supports that the experience of managing multiple languages trains a domain-general ability that manifests as improved performance on tasks that assess separable executive functions. More recent work supports that higher levels of experience with a second language are associated with graded improvements in executive functions. However, little is known regarding how much additional language experience is needed to result in measurable improvement in executive function. To address this question, the present study investigated whether higher amounts of second language experience were associated with greater improvements in executive functions in Chinese primary school students with second language (i.e., English) proficiency. Participants completed a two-week summer teaching support program in which they received either 10 (Low Experience condition; *n* = 46) or 20 sessions (High Experience condition; *n* = 47) of English training. Groups did not differ across background variables nor measures of executive function at the pre-test. Participants in the High Experience condition exhibited faster overall reaction times on both the Attention Network Task and Number Stroop Task compared to the Low Experience condition. Results support that even short periods of language training can modulate executive functions in primary school students who are at the initial stage of English language learning.

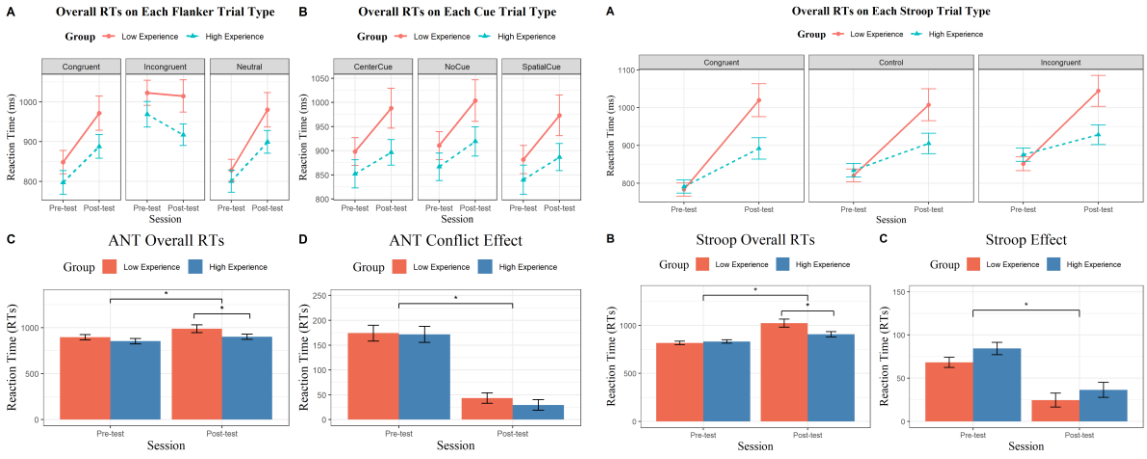

Figure 1. Left: Performance on the Attention Network Task (ANT) at pre and post-test sessions; Right: Performance on the Number Stroop Task at pre and post-test sessions. Error bars represent ±1SE.

WORD SEGMENTATION BY L2 CHINESE READERS

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Sentences in written Chinese are composed of continuous sequences of characters, without spaces or other visual cues to mark word boundaries. While skilled L1 readers can efficiently segment this naturally-unspaced text into words, little is known about the word segmentation capabilities of L2 readers, including whether they employ the same strategies to process temporary segmental ambiguities. Accordingly, we report two eye movement experiments that investigated the processing of sentences containing temporarily ambiguous "incremental" three-character words (e.g., "体育馆", meaning "kindergartens") whose first two characters can also form a word ("体育", meaning "children"), comparing the performance of 36 skilled L1 Chinese readers and 36 high-proficiency L2 Chinese readers in each experiment. Our findings reveal that both groups can process this ambiguity efficiently, employing similar word segmentations strategies. We discuss our findings in relation to models of eye movement control and word recognition in Chinese reading.

Key words: Eye movements in reading, L2 readers, Chinese word segmentation, word plausibility

EFFECTS OF EVENT SIMILARITY AND STRUCTURE PREFERENCE ON SYNTACTIC CHOICES IN SENTENCE PRODUCTION

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Abstract: Language is commonly used in a certain context, e.g., conversation. Under this context, speakers tend to talk about similar or related events and thus the conceptual similarity is often together with similarity in linguistic structures, resulting in a semantic boost effect of structure priming. However, structure priming effects are also modulated by language-specific bias, e.g., structure preference. For example, the less preferred structures are primed only in the identical event (verb repetition) condition, but not in dissimilar event condition. Events like the two-character simple transitive ones can be described in SOV/OSV sentences in Mandarin, such as the preferred active *ba*-constructions and passive *bei*-constructions as well as the less preferred passive *gei*-constructions.

This study aims to investigate whether event similarity can have an effect on speaker's syntactic choice and if yes, whether the effect can be modulated by structure preference. In three structural priming experiments, native Chinese speakers describe pictures of simple transitive events after repeating sentences printed on the top of prime pictures. The prime pictures were manipulated to have identical, similar or dissimilar events with the targets. In each experiment, half of the prime sentences were presented in active SVO constructions and another half were in active SOV *ba*-constructions (Experiment 1), passive SOV *bei*-constructions (Experiment 2) and passive SOV gei-constructions (Experiment 3), respectively.

The results showed speakers repeated the primed structures more often in identical and similar event condition than in dissimilar condition when the primes were preferred constructions (Experiment 1 and Experiment 2), but for the primes including less preferred constructions (Experiment 3), the semantic boost effect was only obtained in the identical event condition but not in the similar event condition. These results demonstrate that event similarity can have an effect on the structure choice in formulation. Chinese speakers also tend to use the same syntactic structures more often when they are exposed to similar events. However, the semantic boost of structural priming is also modulated by structure preference in Chinese, suggesting certain language-specific constrains can play an important role in spoken sentence choices.

Keywords: sentence production, event similarity, syntactic choice, structural priming

THE EFFECT OF IMAGE SPATIAL LOCATION INFORMATION ON IMPLICIT AND METAPHORICAL LOCATION WORDS: AN ERP STUDY

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Human beings rely on the perceptual system and the language comprehension system to acquire world knowledge. Symbolic cognition theory suggests that the information acquired by perceiving an object does not affect the processing of the words that refer to that object, but embodied cognition theory suggests that the information representation of words is derived from perceptual experience. Recent neuroimaging evidence has revealed that there are at least two forms of knowledge representation in the human brain, sensory-derived, language- and cognition-derived knowledge, supported by different brain systems. Whether language comprehension requires the involvement of the perceptual system is controversial. Using a picture-word priming paradigm and an implicit experimental task, this study aims to investigate the mechanism of automatic activation of image information for relevant semantic information in words and to further explore spatial representations in the word.

This study consisted of two experiments that investigated the effect of image location information on the semantic location information implied by implicit (e.g., “天空/sky”, “大地/ground”) and metaphorical location words (e.g., “奖金/bonus”, “坟墓/grave”). The experiment used a 2 (vertical spatial location: up vs. down) × 2 (congruency: congruent vs. incongruent) two-factor repeated measures within-subjects design. The behavioral results found that for implicit location words, the processing advantage of the “up” location information was greater than that of the “down”. However, the processing advantage of the metaphorical “down” location information was greater than that of the “up”. The results of the ERP experiments revealed that image location information does automatically and unconsciously affect the semantic location information of both implicit and metaphorical location words, as well as their early and late processing, but they are different in (1) activation time, with image location information activating the metaphorical location words earlier (~200ms) than the implicit ones (~450ms); (2) activation degree, with the activation of image location information on implicit location words being observed only in the “up” location information, while is significant on both “up” and “down” location information of the metaphorical ones; (3) activation effect, both facilitating (“down” location information as priming cue in metaphorical location words) and blocking (“up” location information as priming cue in both implicit and metaphorical location words) were observed.

In summary, this study found that although image location information can induce the activation of semantic location information in both implicit and metaphorical location words, the two enjoy separate activation mechanisms, which are reflected in the differences in activation time, activation degree, and activation effect, as well as the differences presented by the opposite location information (up vs. down) in vertical space.

Key words: word comprehension; spatial representation; implicit and metaphorical location words; ERP

LANGUAGE ACTIVATION DURING VISUAL SEARCH IMPACTS DISTRACTOR SUPPRESSION

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In our everyday world, we are constantly searching across our visual fields to find objects that are relevant to our goals. Visual search is a well-researched and deeply studied paradigm of experimental cognitive science. As a result of many visual search studies, the phenomenon of distractor suppression has become prominent. The idea that we learn to suppress any salient, but goal irrelevant stimuli over time is a well discussed one. However, in the real world, searching behaviour is rarely meaningless or detached from some language input. We often only look for things that have semantic qualities attached to them. We do not necessarily suppress the presence of anything in our visual field, rather we look through everything around us in order to find what is relevant to our goal. In our study, we attempted to study distractor suppression in the presence of language. We merge the Visual Search paradigm with the Visual World paradigm in order to understand the true nature of eye movements across a search panel when one is looking for the presence of a certain object. Across two experiments, we tested the effect of the salient distractor on eye movements. In experiment 1, where the salient distractor randomly appeared across the search panel, and in experiment 2, where it had a highly predictable specific location of appearance. We asked participants to perform a regular search task, looking for a specific shape but instead of reporting the tilt of a bar inside the target, we asked them to report if the image inside the target was the same as the word they heard with the onset of the search panel (images of the design are attached for reference). We found that there are almost equivalent numbers of looks (proportion of fixations) towards all distractors, implying that there is no distractor suppression that occurs, even over the course of 250 trials. We argue, with support from these results, that the activation of language overrides any distractor suppression and pushes a person to consider all possible distractors. This implies that the distribution of attention across the panel becomes near equal amongst all distractors, in spite of the salience of a specific distractor.

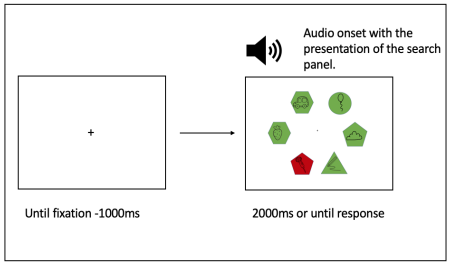

Figure 1. Experimental design for both experiments

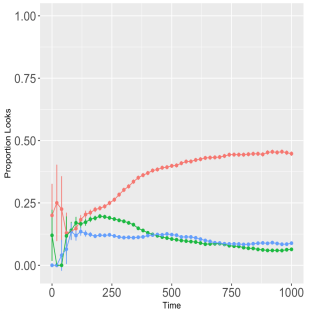

Figure 2. Proportion of fixation plot for Experiment 1.

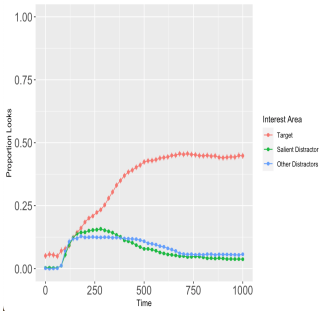

Figure 3. Proportion of fixations plot for Experiment 2.

INFLUENCE OF GRAMMATICAL VOICE ON SCOPE OF SENTENCE PLANNING

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The sentence planning process in language production has been conjectured to be primarily driven either by which one of the individual elements (the *who* and *what*) is taken as the starting point, or by the relational structure between these elements (the *who-did-what-to-whom*). The former is known as the linear incremental, and the latter the hierarchical incremental account of sentence planning. Which one of these strategies is used can depend not only on the properties of the event being described, but also on the grammar of the language being spoken. Grammatical features such as voice, for instance, require a speaker to assign the agent and patient before proceeding with sentence formulation. However, it can be tricky to disentangle the effects of voice vs. other fundamental linguistic properties such as word order. For instance, if the verb is positioned earlier in the sentence rather than later, this can force the processing of relational over non-relational information.

This study uses the visual world paradigm to compare sentence production between the English and Malayalam languages. Malayalam is most notable here for its lack of defined voice constructions, with speakers generally taking advantage of the free word order to rearrange subject and object for purposes of emphasis. It also favours verb-final sentence structures, as opposed to the fixed verb-terminal word order of English. For each trial of the experiment, participants described the transitive event depicted in the image shown to them. Sentences with varying word orders were invoked not only across but within the two languages compared, by pairing each image shown with a question that directed the speaker's response toward either the agent or patient.

On analysing the utterances of participants, the overall trend observed was that Malayalam speakers are more likely to accommodate the cued starting point by modifying the word order as required. Conversely, English speakers tend to favour the more prominent active-voiced structure, and even tend to disregard the cued starting point for the same. These observations were corroborated by the time-course of eye movements during sentence formulation in English and Malayalam respectively. The encoding of relational information was seen to be prioritised earlier and to a greater extent for English than for Malayalam. Passive sentences in Malayalam— i.e., sentences with the Patient as starting point— also showed more relational encoding than was typical for other Malayalam utterances. These results agree with previous accounts that word order and voice exert distinct influences on the scope of sentence planning. The use of distinct voice constructions may be the cause for the prioritisation of relational information during sentence planning in English.

SPEECH PERCEPTION AND SOCIAL MEDIA DATA MINING: NEURAL NETWORK AND GENERATIVE APPROACH

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The speech perception in its multilevel processing system has a rich tradition of research, meanwhile, lately the problems of transformation of perception in a virtual environment came to the fore (Essam & Abdo, 2020). The analysis of perception in a multimodal virtual environment involves the study of the integrated result of the dissemination of information using various modes. When analyzing the specifics of speech perception in this study, preference is given to the neural network and generative approach. In linguistic research, the potential of artificial neural networks is already being used quite actively: neural and statistical approaches in linguistics (Pater, 2019); learning reduplication using a variable-free neural network (Brandon, Traylor, & Pater, 2019) cross-linguistic evaluation of the syntax of neural models (Aaron et al. 2020); linguistic inductive biases via meta-learning (McCoy et al. 2020). New generative tools allow us to take research to a fundamentally new level. Specifically, a non-invasive decoder was presented that reconstructs continuous natural language from cortical representations of semantic meaning recorded using functional magnetic resonance imaging (fMRI) (Tang et al. 2022).

The empirical material for the analysis was the content dedicated to the construction of the Troitskaya metro line (TLM) in Moscow. Data collection was carried out 10/01/2022 - 03/31/2023 in social media Vkontakte, Telegram, YouTube, Dzen. The dataset contains 22,199,085 tokens.

Using a model based on the neural network paradigm of using neural-like elements with temporal summation of signals (the so-called corticomorphic associative memory), was analysis the topic structure of the database and the results of summarization. Such a network representation of the data made it possible to isolate and interpret the semantic network in the form of a set of interrelated concepts. With the help of the semantic network semantic accents that are most important for actors were analyzed and rated. The analysis of word associations, carried out according to the results of associative search and the construction of an associative network, made it possible to identify implicit information characterizing the attitude of actors to certain concepts and processes. Speech data analysis was also carried out using ChatGPT Plus. Sentiment analysis was performed using the Eureka Engine sentiment determination module. The technique is based on a statistical algorithm for conditional random CRF fields using sentiment dictionaries. Sequences of lexems are used as input data, after which the algorithm calculates the probabilities of possible sequences of tags and chooses the maximum probable one. Linguistic content analysis was performed using the AutoMap text mining tool. For visual analytics, the Tableau platform was used.

Analysis of the speech perception by social media users in response to the TLM construction showed that the growth of negative perception (negative sentiment, aggression) is more actively formed and disseminated through personal accounts, thus enabling involvement of a large audience and achieving a higher degree of involvement. Meanwhile, there is a more effective spread of a certain type of perception in communities. Optimization of the speech influence and perception by users is determined by a number of reasons: the accuracy of determining the specifics of the communicative situation, identifying relevant topics, generating messages on relevant topics using an imperative strategy that includes negative sentiment and aggression. An important role is played by the symbolic capital of the source of information dissemination for certain types of actors. One should also take into account the dynamism of communication processes taking place in the network environment and a sharp change in the situation in short time periods. The choice of adequate communication means and successful solution of urgent communication tasks ensures active influence on the perception of network actors and translation of virtual intentions into real actions.

HOW MANY ROLES DO WE NEED IN SENTENCE PROCESSING?

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Theoretical approaches categorize thematic roles in two different ways: (1) lists of independent thematic roles (henceforth TR), such as Agent, Instrument, Experiencer, Patient or Theme, hierarchically organized (Fillmore, 1963, 1971). (2) Proto-Roles approach (henceforth PR) proposes only two proto-roles, Proto-Agent and Proto-Patient to determine subjecthood; the argument with most Proto-Agent entailments becomes subject (Dowty, 1991). There is ample psycholinguistic evidence for agent and patient thematic roles as core knowledge categories, but evidence for other roles is scarce (Rissman & Majid, 2019). We present evidence in favor of PR approach, looking at experiencer role processing. Experiencer role is a participant of psych and perceptual verbs. It can appear combined with a Theme (Experiencer-Theme) or with an Agent (Agent-Experiencer) (Pesetsky, 1995). PR approach considers Experiencer role to be Proto-Agent candidate since it has the proto-agent entailment of sentience. In Agent-Experiencer structures, PR approach predicts that both arguments can be proto-agent, involving larger processing load compared to prototypical Agent-Theme structures. However, in Experiencer-Theme structures, PR approach predicts that only the Experiencer can be proto-agent, facilitating processing compared to Agent-Experiencer. TR approach will not predict higher processing cost in Agent-Experiencer structures, since it considers both arguments to be independent categories, furthermore, Agents are higher in thematic hierarchies than Experiencers. There is psycholinguistic evidence that Agent-Experiencer structures involve larger processing cost in active voice than Experiencer-Theme in active voice (Do & Kaiser, 2021). **Methods**. Eye-tracking reading task. 48 Spanish native speakers. Twenty verbs per condition, repeated twice, controlled by length and frequency, were selected to create forty experimental sentences with four different versions each, as a result of crossing: Verb Type (Psych vs. Non-psych) and Argument Structure (Experiencer-Theme vs. Agent-Theme/Experiencer) variables (see table 1). Experimental sentences were normativized for naturality with an acceptability task. Participants read 130 sentences (10 practice sentences, 40 experimental sentences and 80 fillers). **Results.** Participants' Total Duration fixations were larger on Agent-Experiencer than on Agent-Theme structures at verb region (p=.004). They made larger reading times also on Agent-Experiencer than on Agent-Theme (p=.006). There were not significant differences between Experiencer-Theme and Agent-Theme. **Discussion.** The higher processing load of Agent-Experiencer structures compared to Agent-Theme is explained with PR approach: both Agent and Experiencer are considered Proto-Agents; having two Proto-Agents participants increase difficulty to identify which one is the subject and which one is the object. If they were distinct categories, as TR argues, there should not be such processing load. We argue that only Proto-Agent and Proto-Patient role categories are needed in processing.

Table 1. Examples of experimental sentence per conditions.

Agr Stru	Verb Type	Sentence (Regions: subject/verb/object/post-object/last word)
[**EXP**-THEM]	Psych	La cantante / **desea** / al poeta / durante el recital de / poesía.
[**EXP**-THEM]	Non-Psych	La cantante / **contempla** / al poeta / durante el recital de / poesía.
[**AGT**-EXP]	Psych	La cantante / **enamora** / al poeta / durante el recital de / poesía.
[**AGT**-THEM]	Non-Psych	La cantante / **abandona** / al poeta / durante el recital de / poesía.
		*The singer /**desires/contemplates/makes fall in love/abandons***
		/the poet/during the poetry/recital.

WORD LENGTH AFFECTS LANGUAGE PRODUCTION IN (NON)PREDICTIVE CONTEXTS BUT NOT LANGUAGE COMPREHENSION

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Language is an optimized communicative system in that longer words are used to convey more information than shorter words, as evidenced in corpus analysis (Piantadosi et al., 2011). Mahowald et al. (2013) provides further support for this, showing that people prefer a shorter expression over a longer one (e.g., *bike* vs. *bicycle*) to complete a sentence preamble when the expression is predictable from the preamble (hence carries less information; e.g., *For commuting to work, John got a 10-speed…*) than when it is not (hence carries more information; e.g., *Last week John finally bought himself a new…*). In this study, we investigated if the effect of predictability (or informativeness) on word choice (e.g., bike vs bicycle) generalizes from a force-choice task to language production and language comprehension.

Experiment 1 first aimed to replicate the finding in Mahowald et al. (2013). Participants chose between two expressions of nearly identical meanings but with different lengths (e.g., *bike* vs. *bicycle*) to complete a sentence preamble that was either predictive or nonpredictive of the expressions. Participants more often chose short expressions when the preamble was predictive than nonpredictive ($p=.001$; logit linear mixed effect model). Experiment 2 tested for this predictivity effect on word length in language production. Participants read a sentence with the last word consisting of two letters (e.g., *For commuting to work, John got a 10-speed bi__*) and supplied the last word. Critically, the partial word could be continued into the short or long expression (e.g., bike or bicycle). Participants more often supplied the short expression in the predictive than nonpredictive sentence ($p=.006$; logit linear mixed effect model), replicating the predictivity effect on word length in a production task. Experiment 3 tested for the effect in comprehension, using a self-paced reading task. We manipulated the sentence to be predictive or nonpredictive of the target expression and the target expression to be short or long (e.g., predictive: *Susan was very bad at algebra, so she hated* ***math/mathematics*** *more than science*; nonpredictive: *Susan introduced herself to me as someone who loved* ***math/mathematics*** *more than science*). We did not find a significant interaction between predictivity and length on reading time of the target expression ($p=.740$; linear mixed effect model), failing to replicate the predictivity effect on word length in comprehension.

Overall, the results indicate that people follow the principle of assigning shorter and longer words less and more information respectively in word choice and language production (Experiments 1 and 2). However, in language comprehension people do not use information of likely contexts shorter and longer words are found in to aid language processing. Thus, word length plays a role in language production in predictive and nonpredictive contexts but not in language comprehension. This dichotomy may come about from people being able to control the information rate of their productions according to word length in order to increase comprehensibility for their interlocutor, while not needing to do this and not expecting their interlocutor to do this during comprehension.

ENGLISH LEARNERS' L2 PROCESSING OF THE LEXICAL CUE IN CHINESE MULTI-VERB CONSTRUCTIONS

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English and Chinese have typologically different cues in distinguishing verbs in Multi-Verb Constructions (MVCs), which refer to a series of verbs appearing in a mono-clause, without pauses or conjunctions. Multiple verbs in English are distinguished via morphological cues, represented as finite and non-finite forms. In contrast, Chinese multiple verbs in most cases appear in bare verbs, and the aspectual adverb "*yijing*" (already) as a lexical cue can help determine the function of verbs in Chinese MVCs, i.e., "*yijing"* is only allowed before finite verbs (Li& Thompson, 1981; Xing, 2004). Given the typological differences in the cue of MVCs between English and Chinese, it arises the question of whether English learners can process "*yijing*" in Chinese sentences with multiple verbs in a native-like way.

An online self-paced reading and an offline grammaticality judgement task were designed to test if participants were sensitive to the violated position of "*yijing*" in MVCs and if this lexical cue is processable among English learners. 56 participants including 25 native Chinese speakers (age: 18-20) and 32 English-L1-Chinese-L2 learners (age: 19-21) were involved in the research. Participants in the L2 group were 3rd-year and 4th-year undergraduates of related majors in Chinese studies in UK universities and were ranked as above-intermediate L2 learners according to an HSK model test. The results showed variation in the sensitivity to the lexical cue in different types of MVCs. In sentences with Verb Phrase (VP) as subject, English learners were less sensitive to the lexical cue online and offline in comparison with Chinese natives. However, in other types of sentences, i.e., VP as object, pivotal, and serial verb sentences, they showed native-like sensitivity both online and offline. This evidenced the processability of lexical cues for L2 learners from a morphology-salient L1 and meanwhile revealed the crosslinguistic influence, i.e., "already" is allowable at the sentence initial in learners' L1 and it has been transferred into L2 processing.

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THE ROLE OF FOCUS SENSITIVE PARTICLES IN ENHANCING MEMORY OF DISCOURSE INFORMATION IN MANDARIN

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The role of linguistic cues (e.g., prosodic, morpho-syntactic) in guiding listeners to identify and comprehend important information (i.e., focus) in discourse is well established (Birch & Garnsey, 1995; Ip & Cutler, 2020; Kember et al., 2019). In a variety of languages, such as English, German and Vietnamese, prosodic prominence and focus-sensitive particles are known to be effective cues for language processing (Fraundorf et al., 2010; Spalek et al., 2014; Tjuka et al., 2020). However, little research has been conducted to explore their interactions on the encoding of focused word and its alternatives, and the gap is particularly evident in the case of Mandarin. The purpose of the study is to investigate how focus-sensitive particles (exclusive particle "只" *only,* inclusive particle "也" *also*), marked by prosodic prominence, play a role in enhancing important discourse information in Mandarin.

In a memory delay experiment, eighty participants listened to eight blocks of ten stimuli that included two context sentences introducing a set of three alternatives (e.g., 小云在首饰盒里寻找项链，耳环和手镯。Xiaoyun looked for necklaces, earrings, and bracelets in her casket. 她在想哪件首饰和衣服搭配。She wondered what would go well with her outfit.), followed by a continuation that mentioned the focused word which was one of the alternative sets (e.g., 她只拿了项链。She only took the necklaces.), and then orally answered questions to recall the alternative set in the previous block.

Logistic mixed-effects models were used to analyze the data using the *lme4* package (Bates et al., 2015) in R (R Core Team, 2019). The estimated accuracy of the recall for focus alternatives was significant ($\chi2 = 7.26$, $df = 2$, $p = 0.03$), with 56.2% in control condition, 61.5% in "也" *also* and 60.4% in "只" *only* condition. However, the estimated accuracy of the recall for focused words showed no significant effect ($\chi2 = 4.08$, $df = 2$, $p = 0.13$). Results indicated that, in the presence of prosodic prominence, (1) memory for focus alternatives was enhanced by both types of focus-sensitive particles, although it was marginally significant in the case of "只" *only*; (2) memory for focused words was not significantly improved by either of the focus-sensitive particles, probably due to ceiling effects. Findings in the study contribute to the limited knowledge of the role of morpho-syntactic markings in the processing of information structure in Mandarin, in addition to the established role of prosody.

PARTNER MODELLING IN LINGUISTIC ALIGNMENT IN HUMAN-COMPUTER DIALOGUE: THE ROLE OF REGIONAL DIALECT

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The phenomenon of linguistic alignment has been observed in human-computer interaction (HCI), wherein people tend to linguistically align with their computer partners. For example, if a computer partner has previously used a particular term to refer to an object (e.g., *bicycle* instead of *bike*), people tend to subsequently re-use the same term (i.e., *bicycle*) rather than an alternative one (i.e., *bike*) when referring to that object (known as lexical alignment). Similarly, after hearing their partner produce a prepositional object (PO) description (e.g., *Mike gave a necklace to Emma*), people are more likely to produce PO descriptions of dative events immediately for an unrelated situation (e.g., *The doctor passed an apple to the nurse*), even though the alternative double object (DO) structure (e.g., *The doctor passed the nurse an apple*) would be equally felicitous (known as syntactic alignment). An open question is whether speakers adjust their language production in light of important attributes of the computer partner (e.g., dialectical background, age, gender). Addressing this issue, however, would not only deepen our understanding of the mechanisms underlying linguistic alignment, but also shed light on the social psychological processes underlying people's language behaviors towards computer partners.

This study aims to investigate whether older speakers take partner's regional dialect use into account when producing language to their computer partner. In two experiments, we compared older speakers' tendency to linguistically align with a Shaanxi dialect-accented (a regional dialect in northwestern China) computer partner vs. a Mandarin Chinese-speaking computer partner. In Experiment 1, we compared lexical alignment with the two different partner types in a between-participant design, while in experiment 2, we compared syntactic alignment with the two different partner types in a between-participant design. In each experiment, Chinese seniors (Expt. 1: a total of 71 participants aged from 60 to 88 years old; Expt. 2: a total of 71 participants aged from 60 to 86 years old) were randomly assigned to one of two experimental conditions where their computer partner spoke in Shaanxi dialect or Mandarin Chinese. They were told that they would take turns with their computer partner to describe and match pictures.

Results showed that, firstly, older adults demonstrated alignment with their computer partner at both lexical and syntactic levels. Specifically, in either type of computer partner, older adults were more likely to produce a disfavored name when their partner had used a disfavored name than when the partner had used a favored name in the interaction task (Expt. 1). Similarly, in either partner type, older adults were more likely to produce DO structures when their partner had previously used a DO description than when the partner had used a PO description in the interaction task (Expt. 2). Secondly, the magnitude of syntactic alignment was influenced by the computer partner's dialect use. Syntactic alignment was stronger when

THE INFLUENCE OF MENTAL IMAGERY ON SECOND LANGUAGE MORAL DILEMMAS

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Prior studies found that reading moral dilemmas in a second language (L2) increases utilitarian choices (i.e., sacrificing a few to save many) compared to one's first language (L1). It is argued that mental imagery is less vivid in L2 reading, which decreases immersion and emotional reactions, resulting in an increase in utilitarian choice in moral dilemma tasks. [1]

The current study assessed the influence of mental imagery on moral dilemmas by employing a pretest-posttest design with Japanese (L1) participants who are English (L2) learners. Fifty-four participants were assigned to the experimental group and fifty-eight were assigned to the control group. The experimental group read two English moral dilemmas and answered whether the moral dilemma was acceptable (utilitarian) or not acceptable (deontological) and rated the utilitarian action acceptability on a 6-point Likert scale. Before the posttest, they were exposed to a mental-imagery instruction, where participants were instructed to imagine the scenario while reading. After each decision task, they responded to the Japanese Narrative Transportation Questionnaire (J-NTQ). The control group had the same procedure but without the mental imagery instructions.

The NTQ scores indicated an overall increase in imagery vividness in the posttest of the experimental group; however, there was no such increase in the control group. This result confirms that the imagery manipulation worked as we intended.

The results of the moral decisions showed a marginally significant decrease in the shift of utilitarian choices from pretest to posttest in the experimental group, χ^2 (1, n = 54) = 3.24, p = 0.07 (Figure 1). However, there were no significant changes in the utilitarian choice in the control group, χ^2 (1, n = 58) = 0.18, *n.s.* (Figure 2).

For the change in acceptability rating, the control group showed that those who felt the utilitarian decision to be more acceptable in the posttest also considered the posttest moral dilemma more immersive, F(1, 56) = 4.75, p < .05, R^2 = 0.16. This correlation was not observed in the imagery instruction group, F(1,52) = 0.11, *n.s*.

Figure 1
Circle Graph of Pretest and Posttest Moral Decisions in the Imagery Condition Group

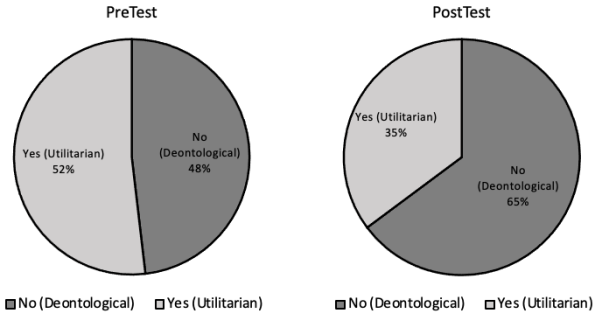
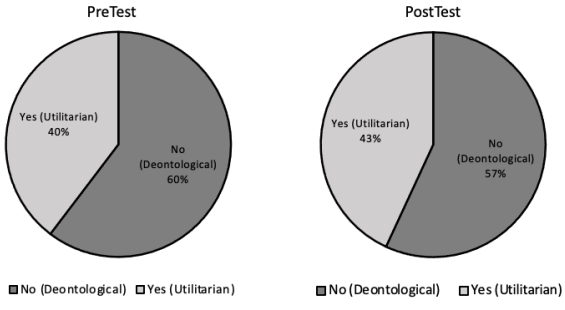


Figure 2
Circle Graph of Pretest and Posttest Moral Decisions in the Control Group



Our results suggest that prompting mental imagery while reading moral dilemmas in L2 leads to a moderate increase in deontological decision-making. Furthermore, the correlations between the changes in imagery vividness and the acceptability of utilitarian judgment, though expected, appear to suggest that more vivid imagery would lead one more toward deontological inclinations, hence dampening the utilitarian trend.

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interacting with a computer partner using Shaanxi dialect, compared to a computer partner using Mandarin Chinese (alignment effect: 0.192 vs. 0.106; Expt. 2). However, the computer partner's Shaanxi dialect use (versus Mandarin Chinese) did not significantly impact the lexical alignment effect in human-computer dialogue (alignment effect: 0.809 vs. 0.810; Expt. 1).

Overall, this study contributes to the understanding of socially-mediated mechanisms underlying linguistic alignment. The findings highlight the potential of linguistic alignment to shape user behavior in HCI and offer practical implications for spoken dialogue system design in influencing users' language choices during interaction.

INDIVIDUAL DIFFERENCES IN SEMANTIC PROCESSING IN OLDER ADULTS: A NATURALISTIC EEG STUDY ON CANTONESE

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The World Population Aging Report (United Nations, 2019) assumes that the population of seniors aged 65 years and over will double in the next three decades. The largest number of seniors will reside in Eastern and South-Eastern Asia. The number of older persons in Hong Kong (HK) alone will double from 1.27 million in 2018 (17.9% of the population) to 2.44 million in 2038 (31.9%). It is, therefore, important to conduct more research on this population and embrace the demographic shift. Previous studies have reported changes in language comprehension due to healthy aging as indicated by N400 ERP. While linguistic knowledge increases because of healthy aging, decline in domain-general cognitive functions such as processing speed and working memory usually affect semantic processing speed. On the other hand, the healthy aging trajectory is not identical for all humans because little is known about inter-individual differences. Therefore, we here investigate what linguistic and cognitive functions would affect semantic processing in older Cantonese speakers. Forty participants listened to 20 minutes of the story Little Prince in Cantonese. In addition to ERP, we also measured verbal fluency, domain-general processing speed, working memory, inhibitory control, naming speed, and linguistic experience such as proficiency and exposure to the languages. Betas were extracted for the time window 300-500ms (N400) using regression-based ERP (rERP). The dependent variable was the average scalp potential over six channels Cz, C3, C4, Pz, P3, and P4. We used Bayesian mixed effect modelling to analyse the data. Our findings showed that domain-specific processing speed as measured by verbal fluency was the most influential variable in language comprehension in older adults. This demonstrates the importance of lexical access speed in bigger lexicons such as the ones in older people.

Keywords: Cantonese, Bayesian, EEG, Healthy Aging, Naturalistic, Semantic processing

THE ROLE OF SWITCHING AND SEMANTIC RELATEDNESS IN LEXICAL RETRIEVAL: EVIDENCE FROM A PICTURE NAMING TASK WITH CHINESE-ENGLISH BILINGUALS

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Lexical access has been a topic of interest for many years, and the processes are generally well-documented and widely recognized: 1) nonlinguistic concept formation, 2) lemma activation, 3) sound representation and articulation (Levelt et al., 1999). But where the locus of language control lies still subjects to controversies. There is a divide in the proposed functional locus or loci of language control, with some models suggesting the concept level and others suggesting that it occurs at the lemma level.

As a response to this controversy, we used picture naming task to investigate a switch at what stage, non-linguistic concept formation or sound representation, could exert a bigger influence on lexical retrieval. Specifically, we used a modified picture naming task a semantic prime was presented before the target picture. Two variables are manipulated: 1) semantic relatedness, that is, whether the semantic prime and the target picture is related or not, and 2) naming language, that is, whether the language required for this trial is the same as the language for the previous trial (see Fig.1). Thirty Chinese–English bilinguals participated in the experiment. Each participant completed 200 trials. The semantic prime was the strongest semantic associate of the target word, decided by USF Free Association Norms. Language History Questionnaire (LHQ-3) was chosen to measure their language ability.

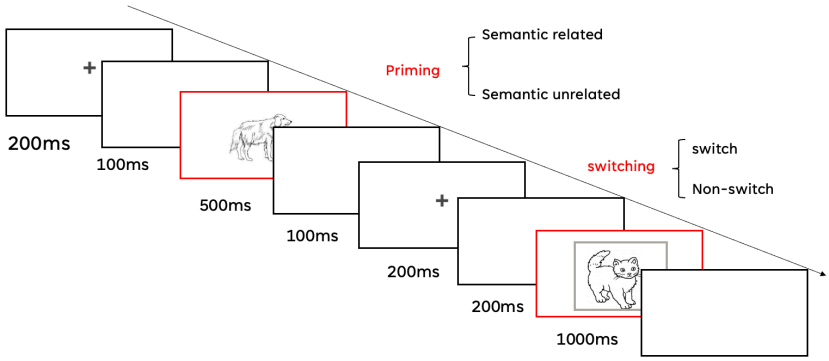

Figure 1 Flowchart of a single trial

In analyzing the results, we firstly conducted Bayesian ANOVA to determine which factors significantly contributed to picture naming latencies. The analysis yielded a higher Bayes factor for the model including switching alone than the model including semantic relatedness alone. Next, to further model the relationship between semantic relatedness and picture naming latencies, we used hierarchical Bayesian, with each participant being

INVESTIGATING COMPLEXITY IN 'THE BILINGUAL EXPERIENCE' AND ITS ROLE IN ADAPTIVE CONTROL

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Bilingualism is a dynamic and complex phenomenon (Bak, 2016) and it is affected by many factors including but not limited to cultural and linguistic environment. It has been found that external non-linguistic cues like culturally iconic images and faces (Woumans et al., 2015; Zhang et al., 2013; Jared et al., 2013; Roychoudhuri et al., 2016; Liu et al., 2021) and also the interactional context (Hartanto & Yang, 2016) of the bilinguals aid in language selection and processing. Both factors have been found to impact language control which in turn effect cognitive control. With this backdrop the main aim of this study was to examine the role of cultural and interactional context in bilingual language processing with a focus on less studied populations. Altogether eight experiments were conducted for the study, four on the role of cultural context and four on linguistic context. A total of 225 participants (54 Rongmei-Meitei bilinguals, 40 Ao-Sangtam bilinguals, 40 Sangtam-Ao bilinguals, 61 Ao-English bilinguals and 30 Nagamese-English bilinguals) took part in the study. The experiments consisted of 5 linguistic task (translation equivalent recognition task and lexical decision task) and 3 non-linguistic task (Simon task, Flanker task and Attention Network Task).

Experiments 1, 2, 3 and 4, investigated the role of culture on bilingual language processing by manipulating iconic culture cues as stimuli for the experiments. Our results did not indicate effect of interference of the culture cues in translation equivalent recognition task when the two languages were not culturally distant (Experiment 1 and 2). This finding is contradictory to other findings with reported effect of interference by the culture cues. Such an effect was observed only in experiment 3 and 4 where the participants were migrant population living in L2 dominant linguistic. The direction of the language turned out to be an important predictor in bilingual language processing as faster response time was observed in L2-L1 translation as opposed to L1-L2.

Experiments 5, 6, 7 and 8 investigated the role of bilingual interactional context on bilingual language processing in general and specifically executive control. As predicted by the Adaptive Control Hypothesis, it was expected that the intensity of demands in the DLC interactional context would modulate language control. But such an evidence was not observed in the linguistic task (experiment 5) as response latency was similar for both DLC and SLC participants. In response inhibition tasks (experiment 6 & 7) efficiency in conflict monitoring in the DLC participants was observed pointing towards the modulating effect of bilingual interactional context on language control processes which in turn could modulate cognitive control. Experiment 8 examined if the difference in the linguistic and social status of a language plays a role in bilingual language processing. The results point towards the role of social status of the language and dominance and thus indicating the importance of context.

Thus findings and observations of this study point towards the issue that distinct bilingual experiences might influence language processing differently. The findings from these experiments also lends partial support towards ACH and the importance of context in bilingual language processing.

EXPLORE THE PROCESSING UNIT OF L2 CHINESE LEARNERS IN ON-LINE CHINESE READING

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The present study explored the processing units of high-proficiency L2 Chinese learners in on-line reading in an eye-tracking experiment. The critical aim was to investigate how they segment continuous characters into words without the aid of word boundary demarcations. Based on previous studies, the embedded words of 2- and 3-character incremental words were manipulated to be either plausible or implausible with the preceding verbs, while the incremental words themselves were always plausible. The results revealed an effect of the plausibility manipulation which suggesting that L2 Chinese learners activated embedded words first and integrated embedded words with previous sentence context as soon as they read them.

SENTENCE PLANNING IN L2: AN EYE-TRACKING STUDY

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Producing an utterance involves a series of complex operations, which requires the generation of preverbal message (message formulation), and then transforms it into linguistic representation through lexical selection and structural assembly (linguistic encoding) . Two leading theories of these processes-hierarchical incrementality and linear incrementality in L1 make different assumptions about these processes of message-to-language mapping. However, the coordination and real-time unfolding of these processes have received relatively little attention in L2 sentence production, despite their crucial role in achieving fluent speech during second language acquisition. Thus, this study is to examine how Chinese-English speakers plan their L2 utterances, focusing on their syntactic choices and fixation patterns using eye-tracking techniques.

We begin by employing visual cueing paradigm to examine the effect of visual salience on speakers' choices in picture descriptions. We calculate the difficulty of event apprehension (event codability) and the ease of character naming (character codability) to analyze the time course of message generation and structural assembly. Specifically, the event codability represents the difficulty of encoding relational information at message-level (action encoding, i.e. 0-400 ms) and sentence-level (verb encoding, i.e. 400-2000 ms). Character codability represents the ease of lexical retrieval at linguistic level. We also consider whether their L2 language proficiency would predict how they coordinate message-level and sentence-level encoding. In this study, participants completed a questionnaire about language history, LexTale test as well as The Oxford Test of English.

In sum, our findings indicate no significant effect of visual salience on the selection of syntactic choices between less proficient L2 speaker and more proficient L2 speakers. However, the analysis of eye movement across early and late time windows (pre- and post-400 ms) suggests that less proficient L2 speakers rely more relational information at both message level and linguistic level than more proficient L2 speakers. To conclude, speakers indeed prefer to separate message-level from sentence-level encoding and to prioritize encoding of relational information when planning L2 sentences, in line with hierarchical incrementality account. Furthermore, language proficiency was found to modulate this tendency, with higher proficiency associated with a shift towards a more linear incremental strategy.

modeled as a random effect. The study used the PyMC3 package in Python, and ran the MCMC algorithm with a total of 1000 iterations, discarding the first 500 iterations as burn-in samples, and the target acceptance rate for the Metropolis-Hastings algorithm used in the sampling is set to be 0.8. The results indicate that the effect of semantic relatedness was weak and not statistically significant, as the credible interval centers around zero.

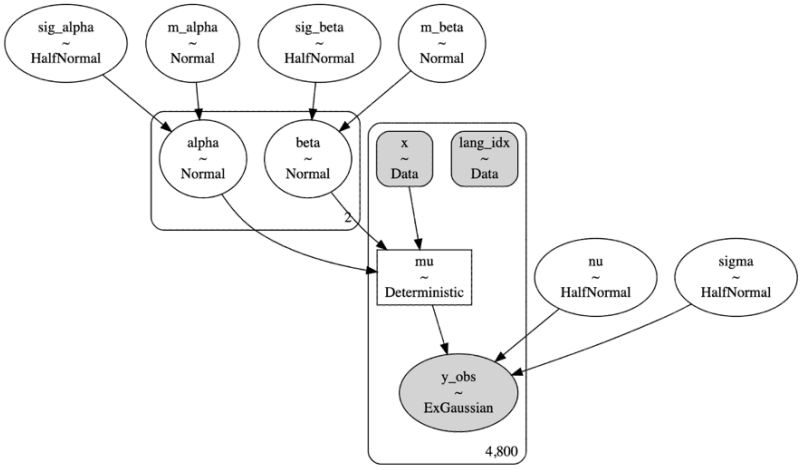

Figure 2 Graphic representation of parameters in ex-Gaussian model

Our findings suggest that switching at the third stage, that is, phonological representation stage, has a stronger effect on picture naming latencies, while semantic relatedness has little or even reverse effect. This indicates that language control might play a bigger role at the third stage, than the other two stages.

THE EFFECT OF VERBAL IMITATION ON PRAISE AND CRITICISM

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We investigated how verbal imitation impacted the perlocutionary effects of praise and criticism. Specifically, we examined whether verbal imitation could influence imitators' reactions to praises and criticisms. We also explored whether the effect of verbal imitation could be modulated by the categories of praises and criticisms. Additionally, we aimed to determine the extent to which the effect of verbal imitation, if present, could generalize from the imitatee to a new speaker.

These research questions have been inspired by studies on nonverbal imitation. Some studies have found that nonverbal imitation can evoke empathy, particularly affective empathy, resulting in an increased tendency for prosocial behavior among participants and even towards others in general. This suggests that verbal imitation, as a form of imitating nonverbal behavior, may have a similar effect of fostering empathy and subsequently promoting prosocial tendencies. Furthermore, it is possible that the effect of verbal imitation may generalize in a manner similar to nonverbal imitation.

To test these hypotheses, we elicited the participants' responses to praises and criticisms. These responses can be understood as the perlocutionary effects of speech within the framework of speech act theory (Austin, 1975). Previous research suggests that criticisms are typically perceived as negative and unpleasant, while praises are usually seen as positive and pleasant. As a result, praises and criticisms may have distinctively valenced perlocutionary effects. Indirect evidence from existing literature suggests that the perlocutionary effects of praises and criticisms may be influenced by the categories of the statements (e.g., appearance and personality), with statements related to personality carrying greater significance to individuals than statements about appearance.

The results of a statement rating task evaluating the pleasantness and truthfulness of statements after participants either imitated or read aloud a passage demonstrated that verbal imitation could influence participants' reactions to praises and criticisms in terms of pleasantness. Imitators tended to feel less unpleasant in response to criticisms and less pleasant in response to praises, compared to the participants in the read-aloud condition. Moreover, these effects could generalize from the imitatee to new speakers. However, no such effects were found in truthfulness ratings. The results of our study provide evidence for the significant role of affective empathy in influencing the perlocutionary effects of praises and criticisms, which can contribute to a better understanding of the social implications of verbal imitation.

PARALLEL PHONOLOGICAL PROCESSING OF CHINESE CHARACTERS REVEALED BY FLANKERS TASKS

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An important and extensively researched question in the field of reading is whether readers can process multiple words in parallel. An unresolved issue regarding this question is whether the phonological information from foveal and parafoveal words can be processed in parallel, i.e., parallel phonological processing. The present study aims to investigate whether there is parallel phonological processing of Chinese characters. The original and the revised flankers tasks were applied. In both tasks, a foveal target character was presented in isolation in the no-flanker condition, flanked on both sides by a parafoveal homophone in the homophone-flanker condition, and by a non-homophonic character in the unrelated-flanker condition. Participants were instructed to fixate on the target characters and press two keys to indicate whether they knew the target characters (lexical vs. non-lexical). In the original flankers task, the stimuli were presented for 150 ms without a post-mask. In the revised flankers task, we set the stimulus exposure time (duration of the stimuli plus the blank interval between the stimuli and the post-mask) to each participant's lexical decision threshold to prevent participants from processing the target and flanker characters serially. In both tasks, reaction times to the lexical targets were significantly shorter in the homophone-flanker condition than in the unrelated-flanker condition, suggesting parallel phonological processing of Chinese characters. In the revised flankers task, accuracy rates to the lexical targets were significantly lower in the unrelated-flanker condition compared to the homophone-flanker condition, further supporting parallel phonological processing of Chinese characters. Moreover, reaction times to the lexical targets were the shortest in the no-flanker condition in both tasks, reflecting the attention distribution over both the target and flanker characters. The findings of this study provide valuable insights into the parallel processing mechanisms involved in reading.

HOW DO MANDARIN NATIVES INTERPRET IMPLAUSIBLE SENTENCES?

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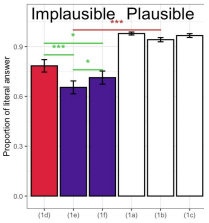
A complete language comprehension mechanism should consider the existence of errors. Based on Shannon(1948) and Levy(2008), Gibson et al. (2013) propose the noisy channel model, arguing the probability $p(s_i \mid s_p)$ for a rational comprehender to infer the intended sentence(s_i) from a perceived sentence(s_p) is proportional to the probability of the intended sentence $p(s_i)$ and the likelihood of the intended sentence to be corrupted to the perceived sentence $p(s_i \rightarrow s_p)$.Previous studies showed the noisy channel model successfully predicted English sentence interpretation. Here we test it in a typologically different language.

Materials & Procedure: Zhan et al. (2023) manipulated sentence structure (active/passive) and plausibility(plausible/implausible). By adding Mandarin Ba sentences, we devised a 3 x 2 design. The table below shows example items and corresponding edits. Although implausible passive Bei and implausible Ba sentences can be formed by substitution between "Bei" and "Ba", Poliak et al.(2023) suggest that substitutions may be somewhat unlikely. Thus we still start with "exchange" here. 81 Mandarin natives read testing items and answered corresponding yes/no questions which allows us to infer whether participants interpret the item literally or not.

Plausible	**Edits**	**Implausible**
1a). 奶奶 打碎了 这个 碗 **(active)** Grandma break-ASP this-CL bowl	NP Exchange across verb	**1d).**这个 碗 打碎了 奶奶 **(active)** This-CL bowl break-ASP grandma
1b). 这个 碗 被 奶奶 打碎了**(passive)** This-CL bowl bei grandma break-ASP	NP Exchange across function word	**1e).**奶奶 被 这个 碗 打碎了**(passive)** Grandma bei this-CL bowl break-ASP
1c). 奶奶 把 这个 碗 打碎了**(Ba)** Grandma ba this-CL bowl break-ASP	NP Exchange across function word	**1f).**这个 碗 把 奶奶 打碎了**(Ba)** This-CL bowl Ba grandma break-ASP

Predictions: The noisy channel framework makes predictions according to the probability of the edits required. The higher edit probability, the higher inference rate, and thus the lower literal interpretation rate, so we expect that the literal interpretation sequence in this study is: Plausible conditions > Implausible active > (Implausible passive=Implausible Ba). **Results & Discussion:** Mixed-effect logistic regression analysis shows:(1) Plausible materials were interpreted literally much more often than the implausible materials ($p<0.001$); (2)Implausible active sentences were interpreted literally more than implausible passive sentences ($p<0.001$) and implausible Ba sentences ($p<0.05$) respectively; (3) In contrast to the prediction, implausible Ba sentences were interpreted literally more often than the implausible passive sentences ($p<0.05$). There may be two possible reasons: (i) Mandarin passive sentences are less frequent than Ba sentences. The prior probability $p(s_i)$ for infrequent structures is low, so other possible intended sentences with higher prior probability become more attractive for comprehenders(Liu et al., 2020); (ii) In addition to exchange, implausible Ba sentences can also be obtained by inserting "Ba" in Mandarin's topic-comment structure "这个碗，奶奶打碎了" (This bowl, grandma broke). Insertions are more likely to happen than exchanges(Gibson et al., 2013), which may influence comprehenders' judgment. The results show the robustness of noisy channel theory, and are also consistent with Cai et al.,(2022) incremental processing theory, which claims that the high literal rate for the implausible active/passive materials compared with implausible dative materials is because readers do not have access to the alternative more plausible interpretation when reading the initial NP and verb.



Ref: [1] Cai et al., Cognition 2022; [2] Gibson et al., PNAS 2013; [3] Liu et al., Amlap 2020; [4] Poliak et al., 2023; [5] Shannon, BellSystTech,1948; [6] Zhan et al., submitted 2023

INVESTIGATING THE COMPONENT PROCESSES UNDERLYING RAPID AUTOMATIZED NAMING (RAN) ACROSS LANGUAGES: EVIDENCE FROM CHINESE-ENGLISH BILINGUALS

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The rapid automatized naming (RAN) task requires people to name aloud recurring simple visual stimuli (e.g., letters and numbers) as fast and accurate as possible. RAN reliably predicts variation in reading ability, though it remains unclear how cognitive processes underlying RAN relate to reading ability, and whether this differs across languages. Using Latin alphabetic and Chinese character stimuli, we evaluated how visual, phonological and – for the first time due to the use of Chinese character stimuli that are inherently carry semantic information – semantic similarity affect both RAN performance (quantified using voice and eye movement measures) and RAN-reading relationships in Chinese L1 - English L2 bilingual adult participants (N = 40). During the experiment, subjects were asked to sequentially name Chinese character and English letters as fast and as acurate as possible, and they were also tested on Chinese and English paragraph reading ability. Results showed that visual but not phonological similarity consistently decreased naming efficiency in all voice and eye movement measures in bilingual RAN. Moreover, semantic similarity increased pause time and decreased saccade amplitude. Finally, pause time and reading errors were found to predict some aspects of reading performance both within and across languages, although the predictive power was not strong (perhaps due to our highly educated subject group). These findings first confirm a key role of visual over phonological processing in RAN in English and Chinese, indicating that RAN quantifies the automaticity of visual processing across language typologies, and predicts reading ability across languages. Moreover, they provide first evidence for a role of semantic processing in RAN, a finding previously unattested due to focusing on alphanumeric RAN stimuli.

ON THE PROCESSING OF FILLER-GAP DEPENDENCIES IN ENGLISH BY KOREAN L2 LEARNERS – AN EYE-TRACKING STUDY

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The shallow structure hypothesis (Clahsen & Felser, 2006) argues that L2 learner's processing mechanism is less sensitive to detailed structural cues than that of natives, while limitation-based accounts (McDonald, 2006; Hopp, 2014) suggest that cognitive resources can modulate the L2 speaker's processing. This study investigates whether L2 learners' sensitivity to abstract syntactic cues during real-time processing is modulated by their working memory or their processing mechanism by itself.

We hypothesized if L2 learners' reduced sensitivity to abstract syntactic cue is attributed to cognitive limitations, higher working memory capacity (WMC) would lead to greater sensitivity to the cue. Twenty-five adult Korean learners of English read sentences including intermediate gap structures (Table 1), following the experimental paradigm of Marinis et al. (2005). All participants have learned English in the classroom setting and never lived abroad or for less than a year, and their proficiency was at or above the upper intermediate level. WMC was assessed using an English version of reading span task. Their eye movement while they read experimental materials was recorded with SMI RED500 (250Hz) and two critical regions were analyzed, where 1) an intermediate gap is placed or equivalent position in control conditions (*that/about*) and 2) the filler-gap integration takes place (*had p.p.*). Sensitivity to the intermediate gap was expected to be shown as longer RTs at the intermediate gap region and shorter RTs at the filler-gap integration region, similar to the patterns observed in native speakers in previous studies. Four reading time measures (*first-pass reading time, go-past time, second-pass reading time, and total reading time*) were analyzed for each region by LMER using R.

The results showed no evidence of a facilitatory effect from the intermediate gap in any reading time measures at both regions, regardless of participants' WMC. Although there was a significant three-way interaction only in the go-past time measure (*estimate=-0.647, S.E.=0.299, t-value=-2.166*), the effect was irrelevant to the intermediate gap facilitation. In conclusion, the data in this experiment suggest that, at least for the intermediate gap structure, higher memory resources does not increase sensitivity. The absence of a facilitatory effect in this study provides supportive evidence for the shallow structure hypothesis that L2 learners are less sensitive to detailed syntactic structural building, by their mechanism rather than their limited mental resources.

Table 1. Example sentences for each condition (*Critical regions were underlined)

Conditions	Example
Extraction-VP (intermediate gap)	The nurse who the doctor argued <u>that</u> the rude patient <u>had angered</u> was refusing to work late.
Extraction-NP	The nurse who the doctor's argument <u>about</u> the rude patient <u>had angered</u> was refusing to work late.
Nonextraction-VP	The nurse said the doctor argued <u>that</u> the rude patient <u>had angered</u> the staff at the hospital.
Nonextraction-NP	The nurse said the doctor's argument <u>about</u> the rude patient <u>had angered</u> the staff at the hospital.

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EMBODIED PROCESSING of L2 EMOTION-LABELED WORDS for LATE CHINESE-ENGLISH BILINGUALS

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Embodied Cognition postulates that semantic knowledge is grounded not only in heteromodel regions in our brain, but modality-specific cortical regions responsible for the coding of perceptual, sensory and motor experience. The processing of words can activate sensory-motor experience that semantic knowledge is based on (Lakoff & Johnson,1980; Barsalou 2008; Annoni *et al*，2022).

Studies using behavioral, electrophysiological and neuroimaging methods show the interaction between sensory-motor experience and words understanding, as well as the activation of sensory-motor area of the brain during the verbal processing (Barsalou & Wiemer-Hastings, 2005； Bergen 2012, 2016; Harpaintner *et al.* 2020; Zanolie *et al.* 2012). However, evidence concerning the embodiment of words are mainly from concrete concepts, whether abstract concepts, such as emotion, are embodied is still controversial, and embodiment of second language in bilingual speakers has been much less addressed.

In the present study, we focus on the embodied processing of emotion-labeled words in late Chinese-English bilinguals whose English is at intermediate level with L1 Chinese as dominant language. Specifically, we aim to examine whether sensor-motor experience of vertical space and color is activated during processing of in English emotion words. If embodied theory is applicable in second language learning, there should be an interaction between vertical space, color and emotional words in English, as it is in Chinese.

30 Chinese-English Bilinguals were selected to participate in the Emotional Categorization task. 36 Chinese and 36 English emotion-labeled words were chosen as stimuli: half of them positive and half negative. The lexical and psychological factors such as arousal, concreteness, word length, and frequency of stimuli were tightly controlled. Results showed that the processing time of L2 emotion words was significantly longer than native language, and the accuracy rate was lower than L1. most importantly, up-down space and red-blue color interfered the categorization of emotional words both in L1 and L2. The reaction speed was faster in congruent condition, when the mapping of response key and color emotion words was congruent with the metaphorical projection of emotional metaphor (positive-up/negative-down; positive-red/negative-blue). This suggests that second language is—at least to some extent—embodied. But for late bilingual who acquire the language in classroom settings and vocabulary is learned through explicit memory with less exposure to sensory-motor experience, the sensory motor involvement is less stronger than L1.

INTERPRETING TRAINING AND MODALITY-SPECIFIC SHORT-TERM MEMORY ADVANTAGE

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Interpreting is a highly demanding bilingual task in which interpreters seamlessly switch between two activated languages and rapidly translate the source language into the target language under extreme time pressure. Therefore, short-term memory (STM), the passive storage capacity of working memory (WM), is crucial for interpreters. While a large body of previous studies has indicated that interpreting training fostered WM capacity and central executive of WM, the beneficial role of interpreting on STM remained inconsistent. Additionally, auditory modality is indispensable for interpreting since language control in interpreting is achieved through language-modality connections according to the attentional control model (Dong and Li 2020). However, it is unclear whether the advantages of interpreters in STM are modality-specific (i.e. auditory-specific).

The current study investigated the effect of interpreting training on both verbal and nonverbal STM and whether any advantages were specific to the auditory modality. We recruited three groups of late Chinese-English bilinguals with different amounts of interpreting training experience: the More-IE group, the Less-IE group, and the No-IE group. The More-IE group and the Less-IE group were second-year postgraduate students majoring in English interpreting and translation, with the former having completed a greater number of interpreting courses and after-class practice during their first year of postgraduate study. The No-IE group was a control group comprising second-year postgraduate students majoring in English literature. All participants completed verbal STM tasks (i.e. digit span task and word span task) and nonverbal STM tasks (i.e. pure-tone and luminance probe-recognition task) in both auditory and visual modalities.

Results showed that the More-IE group outperformed the other two groups only in the auditory verbal and nonverbal STM tasks. Moreover, only the More-IE group exhibited a better performance in the auditory modality compared to the visual modality in both verbal and nonverbal tasks. Our findings suggested that interpreting training, as an intense bilingual experience, significantly contributed to STM performance only in auditory modality regardless of verbal and nonverbal stimuli. Our study provided empirical evidence for the attentional control model (Dong and Li 2020) and motivated further research into the memory mechanism involved in bilinguals.

FEWER PREDICTIONS IN L1 SOURCE LANGUAGE IN CONSECUTIVE INTERPRETING WHEN COGNITIVE LOAD IS HIGH

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Prediction has been regarded as an essential characteristic of language processing by psycholinguistics (1). Simultaneously, it is also recognized as a practical strategy employed by interpreters (2). Given this, it becomes crucial to investigate how interpreters process language in real-time to better understand the predictive characteristic of language processing. Numerous studies have shown that the availability of cognitive resources (e.g., working memory) is one of the most important factors that influence one's ability to predict (3). However, limited studies have explicitly examined the effect of cognitive load on predictive processing in consecutive interpreting, which itself requires high cognitive resources.

To delve into this issue, we recruited 39 native Mandarin (L1) speakers with experience in interpreting between Mandarin and English (L2) to participate in a visual world paradigm eye-tracking experiment. The experiment adopted a design of 2 (verb: unpredictive vs. predictive) x 2 (task: repeat vs. translate) x 2 (load: low vs. high). Participants were instructed to first remember one digit (low load) or five digits (high load), and then listen to a spoken sentence (e.g., "这个男孩想要吃掉/移动蛋糕", *the boy wants to eat/move the cake*, with the former verb predictive and the latter unpredictive of the following noun). After the offset of the sentence, they were asked to repeat or translate the sentence and then type the digit(s) that they had initially heard.

Results indicated that there were more fixations to the target when the verb was predictive than when it was unpredictive in both task conditions, suggesting that participants can use verb information to predict semantically-related upcoming target words in both regular language comprehension (repetition) and L1-to-L2 consecutive interpreting, which is consistent with previous studies showcasing a prediction effect of verb (4-5). Moreover, the prediction effect was not amplified when interpreting compared to repeating, which is inconsistent with a previous study (6). We attribute this discrepancy to the different translation directions between the two studies; theirs asked participants to interpret from L2 to L1, in which the L1 target language may facilitate L2 source language comprehension. Lastly, when cognitive load is higher, participants were less likely to make predictions when interpreting (but not when repeating), suggesting that predictive machinery in consecutive interpreting requires cognitive resources (7), although this effect was only marginally significant.

In conclusion, our study suggests that participants tend to make predictions in their L1 source language in both repetition and consecutive interpreting tasks. Moreover, when cognitive resources are limited, they are likely to make fewer predictions when translating L1 into L2, which supports the idea that prediction in comprehension requires cognitive resources.

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WHAT TRIGGERS ATTRACTION EFFECT OF HONORIFIC AGREEMENTS IN KOREAN

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This research study delves into the attraction effect observed in the processing of subject-verb honorific agreement in the Korean language. Although sentence processing has extensively explored this effect, there is a noticeable gap in the literature regarding its investigation in Korean. The main objective of this research is to examine the impact of the intervening honorific affix (-si-) on the resolution of dependencies with the following questions. How does the intervening affix (*-si-*) affect the attraction effect? Specifically, does the intermediate activation triggered by the intervening affix (*-si-*) disrupt the appropriate resolution of dependencies? To answer these questions, a self-paced reading experiment was conducted utilizing the web-based platform, PCIbex Farm.

Experiment: The stimuli consisted of a main clause and an embedded adjunct clause, with the subject of the main clause and the verb in the embedded clause varying in honorific features (H: Honorific, N: Not-honorific) as in (1). In order to test the effect of the honorific marker exclusively, non-honorific nouns were used as embedded subjects. The main verbs consistently carried honorific markers (*-si-*) across conditions. Sixteen sets of experimental sentences (64 sentences = 16 sets X 4 conditions) were created.

(1) H / N N

{cwuim-nim-i / Cayhwuni-ka}	*ppalli*	[*Minho-ka*	*sanghwangul*
chief-**HON**-NOM / Cayhwuni-NOM	quickly	M.-NOM	situation-ACC
phaakha-(si)-key]	*motun*	*pokose-lul*	*nemkyecwu-**si**-ess-ko, …*
Figure out-(HON)-C	all	document-ACC	Hand over-**HON**-PAST-DEC, …

a. *H-si:'The chief handed over all documents to him so that M. could figure out the situation quickly and…'
b. H-x:'The chief handed over all documents to him so that M. could figure out the situation quickly and …'
c. *N-si:'Cayhwun handed over all documents to him so that M. could figure out the situation quickly and …'
d. *N-x:'Cayhwun handed over all documents to him so that M. could figure out the situation quickly and …'

Results: In Korean, honorific agreement occurs within the same clause boundary. As personal names (e.g., *Cayhwun*) in the main subject lack honorific features, the presence of *-si-* on the main verb leads to ungrammaticality. The critical word positions were the embedded verb (region 5), with or without *-si-*, and the main verb (region 8), which consistently had *-si-*. The results from 74 native Korean speakers are summarized in Figure 1. Regardless of the presence of honorific markers on the main subjects, a significant slowdown in processing was observed when *-si-* appeared on the embedded verbs at Region 5. This finding indicates that honorific agreements strictly adhere to clause-mate conditions, specifically with the embedded subject having a non-honorific feature. Interestingly, we also found that the presence of *-si-* on the embedded verb actually reduced processing costs for the main verb (H-si vs. H-x, N-si vs. N-x), despite its ungrammaticality. We propose that the failure of honorific agreement between the embedded verb and the subject may lead parsers to inadvertently reestablish the honorific feature of the embedded subject, using pragmatic strategies. It could mistakenly imply that the subject of the embedded clause (i.e., *Minho*) has a high status, leading to the subject of the main clause (i.e., *Cayhwun*) also being perceived as having a high status, as personal names must be treated equally in terms of their pragmatic relationship.

Conclusion: In summary, this study suggests that the intermediate honorific affix (*-si-*) may induce a pragmatic relationship reset to resolve mismatches in Korean subject-verb honorific agreement and consequently reduces the processing difficulty of the ungrammaticality.

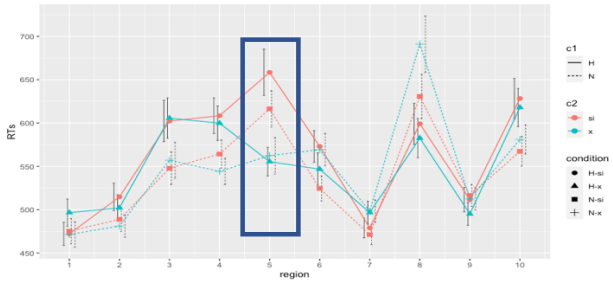

Figure 1. Average reading time by regions (ms)

THE INFLUENCE OF NON-NATIVE ACCENT ON PRONOUN RESOLUTION IN CHINESE: EVIDENCE FROM EYE-TRACKING

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Nativeness of speech influences language comprehension in various aspects. The processing of speech with a non-native accent is often delayed in semantic integration (Grey & van Hell, 2017) and impaired in lexical priming (Braun et al., 2011). Mixed evidence has been reported on how non-native speech affects the way native listeners use and integrate different types of cues. Native listeners, when exposed to non-native speech, tend to rely more on contextual cues than lexical cues (Lev-Ari, 2015), while counterevidence has been reported by Contemori & Tortajada (2020), demonstrating that non-native accents lead to an increased reliance on linguistic cues and reduced attention to non-linguistic cues.

This study aims to explore whether non-native speech alters the usage pattern of semantic cues (i.e., implicit causality information) and phonetic cues (i.e., contrastive focus) in comparison to native speech. Implicit causality information encoded in the verb facilitates the pronoun resolution in the forthcoming clause (Caramazza et al., 1977). Contrastive focus, according to Itzhak and Baum (2015), regulates the effect of semantic information in the online processing of native speech. As to non-native speech, how comprehenders make use of these two types of information remains unclear.

In this visual world paradigm eye-tracking study, we investigated the influence of non-native accents on pronoun resolution guided by implicit causality information and contrastive focus. We recruited 61 native Chinese participants (female: 42; average age: 22). They listened to spoken Chinese sentences presented in either a native or non-native accent while simultaneously viewing a visual display consisting of two characters. Both types of sentences contained IC verbs biased towards NP1 or NP2, and varied in the contrastive focus patterns on these two NPs (the focus is on NP1 or NP2).

The data reveal that a non-native accent regulates listeners' use of various information sources. Participants consistently resolved pronouns in accordance with the IC-verb bias across different accent conditions, demonstrating robust influence of semantic cues in processing. However, in the causal connective and pronoun phases, they exhibited different patterns of using structural prominence information and contrastive focus in the two accent conditions. Specifically, non-native accents significantly increased gazes towards the NP1 referent (subject) (cf. Figure 1). This preference may be attributed to an increased emphasis on structural cues when processing the non-native accent (Contemori & Tortajada, 2020).

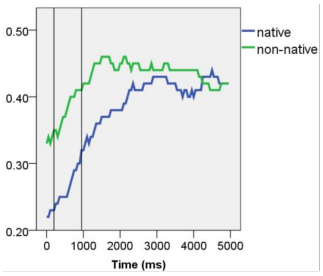

Figure 1. Proportion of looks to the interest area of the NP1 character time-locked to the onset of the connective (t=0 ms), under the native accent (blue) and non-native accent (green) conditions. Vertical lines represent the onset of the causal connective and pronoun (0.2 s added).

A marginally significant interaction between accent and contrastive focus emerged during the pronoun phase. In particular, under the non-native accent condition, the presence of contrastive focus on NP2 directed more gazes to the referent of NP2 (cf. Figure 2); and such an effect was absent in the native accent condition. The finding that contrastive focus can more significantly guide listeners' attention under non-native accent suggests that during non-native accented language processing, contrastive focus plays a more pronounced role than it does in native language. A non-native accent prompts listeners to place greater emphasis on contrastive focus cues in the process of pronoun resolution.

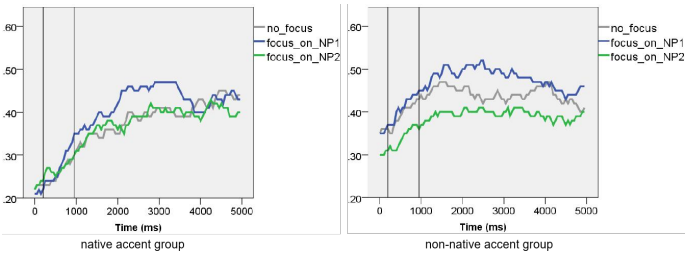

Figure 2. Proportion of looks to the interest area of the NP1 character time-locked to the onset of the connective (t=0 ms), under no focus (grey), focus on NP1 (blue) and focus on NP2 (green) conditions. Vertical lines represent the onset of the causal connective and pronoun (0.2 s added).

The preliminary results show that accents influence the type of information listeners tend to rely on in real-time sentence processing. For future studies, incorporating speakers that vary in accent strength and language backgrounds will contribute to the understanding of how different accents impact online processing.

NEURAL SIGNATURE OF CHINESE CHARACTER AMNESIA: AN FNIRS STUDY

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The digital age has seen handwriting being marginalized as a medium of written communication, leading to much decline in handwriting literacy, especially in non-alphabetic writing scripts. Chinese for instance, the marginalized role of handwriting had attributed to an increased failure in accessing orthographic forms, known as character amnesia [1]. Despite previous neuroimaging attempts to identify the brain areas involved in handwriting [2], little insight has been gained regarding the neurocognitive underpinnings of character amnesia. To address this issue, this study made use of fNIRS (consisting of 24 sources and 24 detectors), which is relatively tolerant to motion artifacts inherent in handwriting. Twenty-three native adult Cantonese-speakers carried out a written-to-dictation task. Following a fixation period varied between 4000 to 6000ms (jitter event-related design), participants heard a dictation prompt (e.g., 粵劇嘅粵/jyut6kek6ge3jyut6/, meaning “Cantonese” from the word “Cantonese opera”) and wrote down the target character on a sheet on top of a Wacom Intuos tablet. If they forgot how to write the character, they drew hash marks (i.e., #) such that the strokes in the hash marks were the same as the stroke in the target character. Then following a second fixation appeared, participants were presented the target character and reported their handwriting as a correct handwriting, character amnesia, or incorrect handwriting. A general linear model with a hemodynamic response function (HRF) was applied to Oxy-Hb started from the onset of dictation prompt to the offset of handwriting (i.e., writing latency + writing duration), beta values served as indicators of brain activity for each trial. In an LME model controlling for character frequency, regularity, context word familiarity, and number of stroke production, we found that, compared to the correct handwriting trials, character amnesia trials elicited significantly less brain activation in the right middle occipital gyrus (rMOG; t = -3.40, p = 0.026, *FDR-corrected*), right supramarginal gyrus (rSMG; t = -3.58, p = 0.026, *FDR-corrected*), and marginal significantly less brain activation in the left postcentral gyrus (lPoCG; t = -2.96, p = 0.077, *FDR-corrected*). These results indicated that rMOG, rSMG, and lPoCG are associated with character amnesia in Chinese handwriting. While rMOG and lPoCG have been shown to be involved in Chinese orthographic processing, since greater activation was observed in stroke retention [3] and stroke order processing [4]. rSMG is relevant with phonological processing [5], since the effect of TMS over rSMG disrupted people’s performance in judging the number of syllables of printed words (i.e., orthography-to-phonology conversion; [6]). These findings might potentially indicate that character amnesia is relevant with incomplete activation in the graphemic buffer (i.e., rMOG and lPoCG) and phonology-to-orthography conversion (i.e., rSMG).

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THE INFLUENCE OF LONG-TERM FAMILIARITY WITH NONNATIVE ACCENTS ON RAPID PERCEPTUAL ADAPTATION

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Introduction Speech communication often occurs in challenging listening conditions (e.g., speech-in-noise, accented speech). Although listeners can generally adjust to these adverse conditions -- for instance, even brief exposure to an initially unfamiliar nonnative accent can significantly improve speech recognition [1-4], their ability to do so vary considerably. Some studies suggest that individuals with more exposure to a particular accent [5] or to a diverse range of accents [6] may adapt better to a novel accented talker. This hypothesis has not yet been tested regarding longer-term experience beyond laboratory exposure. Under exposure - test paradigm, we asked how native English listeners from different regions of the US, which differ in the prevalence of Mandarin-accented English, adapt to an L2 Mandarin-accented talker. Results showed that rapid adaptation occurred, despite insignificant difference between two types of exposure environment.

Design Native English listeners (n = 33) were recruited through Prolific. Subjects were divided into **Accent-Familiar group** and **Accent-Unfamiliar group** by their current state of residency given drastically different percentages of Mandarin-speaking population (3.2% vs. 0.2%). A cross-modal priming task was used to measure speech recognition performance [3] [4]. During exposure, listeners responded if the final word of a heard sentence matched a printed word on the screen (Figure 1). In the final test block, they responded to sentences produced by a novel Mandarin-accented talker (test_accent}) and speech-in-noise from a novel native-accented talker (test_noise}) (Figure 2). Finally, in the baseline block, they responded to sentences produced by another native-accented talker. Reaction times (RTs) were adjusted by subject against that of the baseline block to normalize for individual differences in response latency.

Results Both groups demonstrated rapid adaptation during exposure, with RTs decreasing over the exposure blocks (Figure 2). However, we found insignificant difference between the **Accent-Familiar group** vs. **Accent-Unfamiliar group** in either test conditions (*ps* > .10). We currently do not have conclusive evidence that those who were expected to be more familiar with Mandarin-accented speech experienced less difficulty, at least when the talker switched between exposure and test blocks which involves some generalization of adaptation. As our sample size grows, we might see results suggesting that resilience to an adverse listening condition can, at least in part, be developed through long-term exposure and may be trainable, with important implications for future translational and clinical research.

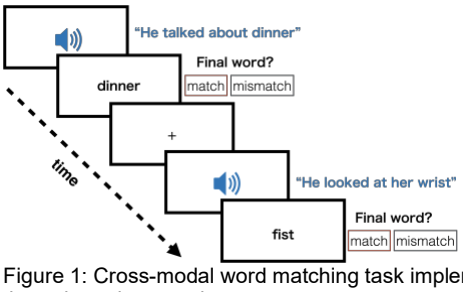

Figure 1: Cross-modal word matching task implemented throughout the experiment.

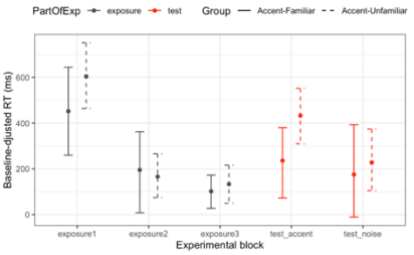

Figure 2: Baseline-normalized RTs by experimental block and group during the exposure and test phases. Error bars represent 95% bootstrapped confidence intervals.

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BILINGUAL NUMBER ACQUISITION IN YOUNG CHILDREN

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The count sequence (e.g., one-two-three-four) is initially a meaningless string for young children. Over the course of 1 to 3 years, children learn the meanings of individual number words, before acquiring the meaning of counting. The developmental trajectory in number word learning has been shown in numerous culture and language groups. Although many children are raised in a multilingual environment, little is known about the development of early number word learning in bilingual children. In this study, we ask whether number word learning transfers between languages in children learning English but also Chinese or Malay. We tested 145 bilingual children between the ages of 2 and 5 in Singapore, a multilingual and multicultural society. The Give-N Task (Wynn, 1990, 1992) was used to assess children's number word knowledge. We found that children's number knowledge is significantly correlated between languages (tau = .76, $p < .001$), and that once children learn the counting principles, they demonstrate counting knowledge in both languages. However, among children who have acquired small number word meanings, only approximately half of them showed the same number word knowledge in both languages. We also found that a small group of children were unable to recite the count sequence in one language and nevertheless demonstrated small number knowledge in that language. Yet, children who lack counting fluency in one language sometimes failed to use counting to give large numbers in that language. These findings suggest that counting fluency may affect small and large number acquisition differently. Finally, we found that the instruction language may play a larger role in early number word acquisition than the home language environment. Together, these findings extend previous studies to a new sample of bilingual children and point to a possibility that early number words are learned as translation equivalents in bilingual children.

Day 3 Poster Presentations

December 3, 2023

INFLEXIBLE ADAPTATION AND OVERRELIANCE ON SEMANTIC PROCESSING IN CHINESE CHILDREN WITH DEVELOPMENTAL LANGUAGE DISORDER: AN ERP STUDY OF N400-P600 TRADEOFF

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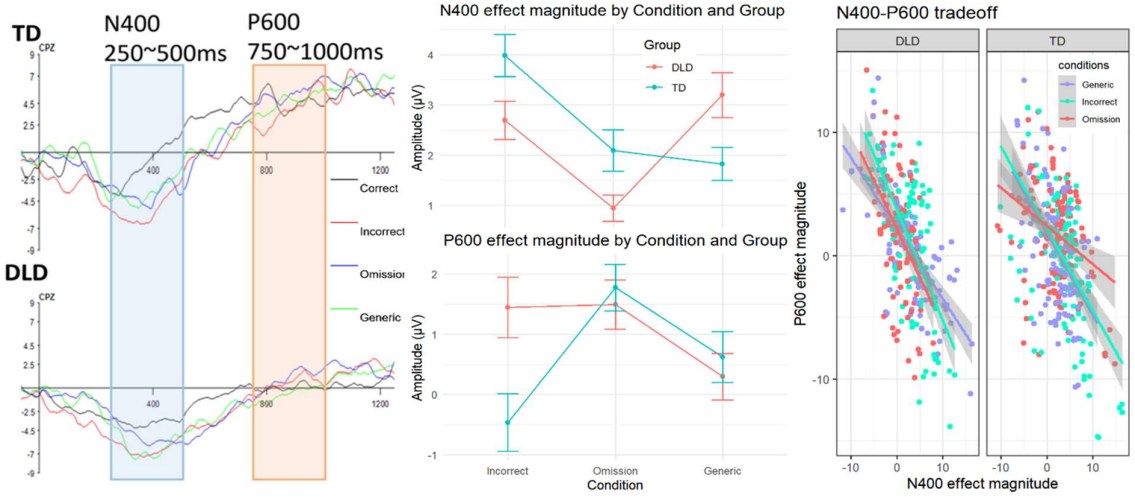
Abstract: Exploring the neurobiological basis of Developmental Language Disorder (DLD) is challenging, particularly in determining whether it constitutes grammar-specific deficits or interacts with broader non-morphosyntactic processes like semantic processing. Using event-related potentials (ERPs), we investigated semantic (N400) and syntactic processing (P600), and their interaction (N400-P600 tradeoff) in Chinese children with DLD. We tested 14 children with DLD (aged between 6 to 11 years old) and 14 typically developing age-matched (TD) peers in a grammaticality judgement task of auditory sentences. Chinese classifier-noun agreements are manipulated: correct classifier (baseline), incorrect classifier (semantic anomaly), generic classifier (minor semantic anomaly), and classifier omission (major syntactic anomaly). Behaviorally, the DLD group exhibited difficulties with Chinese classifiers (lower overall accuracy). ERP results revealed distinct patterns for the two groups (a significant condition-group interaction in mixed-effects models): in the DLD group, generic and incorrect classifiers triggered similar N400 effects, unlike the graded responses in the TD group. They also showed comparable P600 effects for classifier omissions and incorrect classifiers, despite the differences observed in the TD peers. Further analysis revealed a significant interaction between N400 effects, conditions, and groups on P600 effects. The DLD group showed consistently steep slopes in the N400-P600 tradeoff across all conditions, differing from the TD children who exhibited a flatter slope for classifier omission. That is, while the TD group showed enhanced syntactic processing (a robust P600 effect) relatively independent of their N400 effect during major syntactic anomalies, the DLD group lacked this modulation - their syntactic processing remaining consistently tied to their semantic processing. Our findings underscore a unique, possibly maladaptive, interaction between syntactic and semantic processing in some Chinese children with DLD. This suggests they may have reduced flexibility in adapting to varying degrees of semantic and syntactic violations, face challenges in prioritizing syntactic processing, and potentially over-rely on semantic processing as a compensatory mechanism during syntactic challenges. Such insights emphasize DLD's complexity beyond syntactic deficits and highlight the need to explore potential compensatory mechanisms. Further data collection and update is ongoing.



NOVEL EVIDENCE FOR AGING EFFECTS ON WORD SEGMENTATION IN CHINESE READING

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College-aged readers use highly efficient strategies to segment and recognize words in naturally-unspaced Chinese text. Whether this capability changes or is preserved across the adult lifespan is unknown, although segmenting words in unspaced text may be especially challenging for older readers. Accordingly, we conducted two eye movement experiments to test for adult age differences in word segmentation, each with 48 young (18-30 years) and 36 older (65+ years) native Chinese readers. Following Zhou and Li (2021), we focused on the processing of “incremental” three-character words, like 幼儿园 (meaning “kindergarten”), which contain an embedded two-character word (e.g., 幼儿, meaning “children”). In Experiment 1, either the three-character word or its embedded two-character word was presented as the target word in sentence contexts where the three-character word always was plausible, and the embedded word was either plausible or implausible. This enabled us to assess whether, by incrementally segmenting the three-character word, readers would access its embedded word’s lexical representation and so produce similar word plausibility effects for sentences containing two- or three-character target words. Both age groups produced word plausibility effects only for sentences with two-character targets. This replicated Zhou and Li’s finding that young adults do not segment words incrementally, while showing that young and older adults employ similar word segmentation strategies. Experiment 2 replicated these findings using a modified experimental design, further demonstrating that neither young nor older adults segment words incrementally. Crucially, the findings reveal that young adults’ word segmentation strategies are preserved in older readers.

Keywords: Cognitive Aging, Eye Movements during Reading, Word Segmentation, Chinese Reading

CONSTRUCTING A 30-ITEM TEST FOR CHARACTER AMNESIA

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In the digital age, handwriting literacy has declined to a worrying degree, especially in non-alphabetic writing systems. In particular, Chinese (and also Japanese) handwriters have suffered from character amnesia (提笔忘字), where people cannot correctly produce a character though they can recognize it. Though character amnesia is widespread, there is no diagnostic test for it. In this study, we developed a fast and practical test for an individual's character amnesia rate calibrated for adult native speakers of Mandarin. We made use of a large-scale handwriting database, where 42 native Mandarin speakers each handwrote 1200 characters from dictation prompts (e.g., 水稻的稻, read $shui_3$ dao_4 de dao_4 meaning ``rice from the word rice-plant''). After handwriting, participants were presented with the target character and reported whether their handwriting was correct, they knew the character but could not fully handwrite it (i.e character amnesia), or did not understand the dictation phrase. We used a two-parameter Item Response Theory to model the correct handwriting and character amnesia response, after excluding the don't-know responses. Using item characteristics estimated from this model, we investigate the performance of short-form tests constructed with *random*, *maximum discrimination*, and *diverse difficulty* subsetting strategies. We construct a 30-item test that can be completed in about 15 minutes, and by repeatedly holding out subsets of participants, estimate that the character amnesia assessments from it can be expected to correlate between r=0.82 and r=0.89 with amnesia rates in a comprehensive 1200 item test. We suggest that our short test can be used to provide quick assessment of character amnesia for adult Chinese handwriters and can be straightforwardly re-calibrated to prescreen for developmental dysgraphia in children and neurodegenerative diseases in elderly people.

THE EFFECTS OF AUDITORY FEEDBACK ON VERBAL SELF-MONITORING OF EFL LEARNERS

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The speakers are supposed to monitor the forms and meanings of their spontaneous speech to make their communication proceed successfully, and when a speech error is detected, they may interrupt themselves and make a repair. The whole process is known as self-monitoring, and the process of repairing speech errors is known as self-repairs. The current theories and models of self-monitoring in L1 are in support of the phenomenon that there are two stages of self monitoring, but whether there are two stages of self-monitoring and self-repairs in L2 and how to distinguish these two stages are rarely discussed. Besides, there is no consensus on that to what extent does the detection of speech errors by self monitoring depend on auditory feedback, especially for the EFL learners.

This study aims to investigate the situation of self-monitoring and self-repairs and the effects of auditory feedback on self-monitoring of EFL learners. Three research questions are addressed: 1) Are speech errors detected by self-monitoring of EFL learners both before and after speech initiation? If so, how can we distinguish between these two classes of detected speech errors? 2) Are there two different processes for self-repairs of EFL learners, one leading to very fast and one leading to slow repairs? 3)To what extent does the detection of speech errors by self-monitoring of EFL learners depend on auditory feedback?

To answer the above questions, 60 sophomores majoring in English from a university in Jiangxi province were recruited in the study. The participants received a classical SLIP experiment, and two lists of stimulus items which are composed of two English CVC forms will be used as the materials. Error-to-cutoff time and cutoff-to-repair time were assessed with and without auditory feedback. The main results are: 1) the detection of speech errors in internal and external stages was reflected in a bimodal distribution of error to-cutoff time; 2) the repairs of external speech errors were planned in a timeconsuming way, but the repairs of internal speech errors were not; 3) the detection of external speech errors did not depend on auditory feedback.

Theoretically, this study can further confirm the theory of forward modeling account of self-monitoring and help to discover the function of auditory feedback in self-monitoring from the perspective of EFL learners. Practically, it can deepen and expand the researchers' understanding of the mechanism of self-monitoring of EFL learners and help to understand the mental processes of their speech production.

DEPENDENCY LOCALITY OPTIMIZED FOR COMPUTATIONAL RATIONALITY

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Language processing requires active engagement of the computational resources of the cognitive system. For example, when comprehending a long-distance dependency, as in (1), the antecedent "key" is maintained active in working memory to be retrieved later at "was". However, computational resources are often limited, acting as an evolutionary pressure that constrains the overall length of syntactic dependencies in language, an efficiency principle termed *dependency locality* [1]. The current study argues that the principle of dependency locality is optimized for computational rationality in language processing [2].

Hypothesis. As an instantiation of computational rationality, memory resources are strategically allocated: More resources are allocated to encode novel and unpredictable information, yielding a more robust memory representation against interference [3]. For syntactic dependencies, we hypothesize that antecedents less predictable from context may get better memory representation, and can be more accurately retrieved later [4-5]. Therefore, we predict that less predictable antecedents should be able to tolerate longer dependency length since they have been strategically given more memory resources to process.

Method. We examined the hypothesis in English using the Georgetown University Multilayer (GUM) corpus[6] taken from Syntactic Universal Dependencies project (SUD)[7]. We obtained from GPT-3 neural language model[8] the surprisal of each word (the negative log probability of the word given a context $-\ln p(w|c)$), with all the text that precedes the target word in the corresponding document fed into the model as the context. We then collected all the syntactic dependencies (*N*=89099) contained in each sentence. The dependency length is calculated as the number of intervening words between the head and the dependent.

Result. We fit a linear mixed effect model as in (2), with antec-surpr (antecedent surprisal) as the critical fixed effect, and antec-deprel (syntactic relation of the antecedent in the dependency) as the random effect. We also included three control variables: sent-pos (sentence position in the text), antec-pos (antecedent position in the sentence), and sent-len (word counts of a sentence). Crucially, we find a significant positive effect of antecedent surprisal on the dependency length ($\hat{\beta}$=0.16, p<0.001), whereby the dependencies with antecedents of higher surprisal bear longer dependency length (Figure 1). For control variables, longer sentences have longer dependency length ($\hat{\beta}$=0.54, p<0.001); antecedents appearing earlier in the sentence have longer dependency length ($\hat{\beta}$=-0.52, p<0.001); there is no effect of sentence position.

Conclusion. We find that the dependency locality is modulated by the predictability of antecedents, which is proportional to the amount of computational resources required for processing. This supports that dependency locality is further optimized for computational rationality in language processing. Broadly speaking, our result suggests that cognitive constraints such as memory limitations act as an evolutionary force that shapes the structure of human language [9].

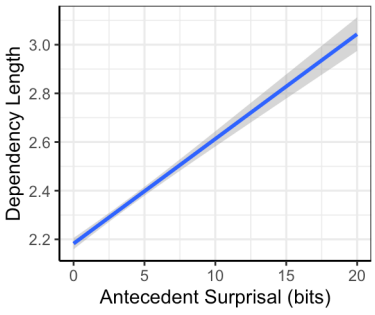

Figure 1: Correlation between antecedent surprisal and dependency length

(1) The key to the cabinet was in the drawer.

(2) dep-length ~ sent-pos + antec-pos + sent-len
+ antec-surpr + (antec-surpr | antec-deprel)

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THE PROCESSING COST OF ENRICHED COMPOSITION IN COMPLEMENT COERCION: ASPECTUAL VERBS VERSUS PSYCH VERBS IN MANDARIN CHINESE

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This study aims to examine whether *aspectual verbs* and *psych verbs*, both previously considered verbs triggering complement coercion, engender similar processing profiles. Complement coercion involves a repairing of the semantic type mismatch between an event-selecting verb and an entity-denoting noun phrase (NP) complement (e.g., *started the book*), via coercing the entity complement into an event (e.g., 'reading the book') (Pustejovsky, 1995). Such an operation enriches semantic composition and is supposed to engender interpretive cost (e.g., McElree et al., 2001). Few recent studies posited that the two types of verbs mentioned above differ in their argument selections, and thus may yield distinct processing profiles when paired with an EntityNP (Katsika et al., 2012).

With this speculation, the current study recorded self-paced reading times (RTs) of 55 Mandarin Chinese speakers to investigate the processing of entity complements preceded by three verb types: (a) *aspectual verbs*, which semantically require an eventive complement, (b) *psych verbs*, which are subject to debate whether or not they inherently take an eventive complement, and (c) *control verbs*, which select an entity complement. 63 triplets of experimental sentences were included. They were generated by three norming tests: *preference norming*, *cloze norming*, and *acceptability norming*. One example is shown below. The crucial premise for the current study is that the predictability of entity complements following aspectual and psych verbs respectively was normed to have little difference.

Prior to statistical analyses, data were cleaned by two steps mentioned in Xue et al. (2021). The remaining data were then analysed with R software. We first calculated mean RTs for each type of sentences at four critical regions: verb, complement NP, the two post-NP regions (i.e., NP+1 and NP+2), and difference-adjusted 95% mixed-effect-model-based intervals (Politzer-Ahles, 2017). The intervals indicate that when one sentence type's interval does not include another sentence type's mean, the two types are likely (but not guaranteed) to be significantly different in a mixed effect model. The results are illustrated in Fig. 1 below. The statistical analyses were conducted by performing separate linear mixed-effects models with *lme4* package (Bates et al., 2015) on the four critical regions.

The main results are that the complements NPs elicited longer RTs when following aspectual verbs than psych and control verbs, particularly at the two post-NP regions. The results confirm the processing cost of complement coercion, and more importantly, contribute evidence to constrain the mechanism of complement coercion to aspectual verbs only.

e.g., 作家(a) 开始/(b) 享受/(c) 撰写这本小说之前打开一扇窗户
zuò-jiā kāi-shǐ/xiǎng-shòu/zhuàn-xiě zhè-běn xiǎo-shuō zhī-qián dǎ-kāi yī-shàn chuāng-hù
author start enjoy write this-CL novel before open one-CL window
'The writer opened a window before starting/enjoying/writing this novel.' (CL = Classifier)

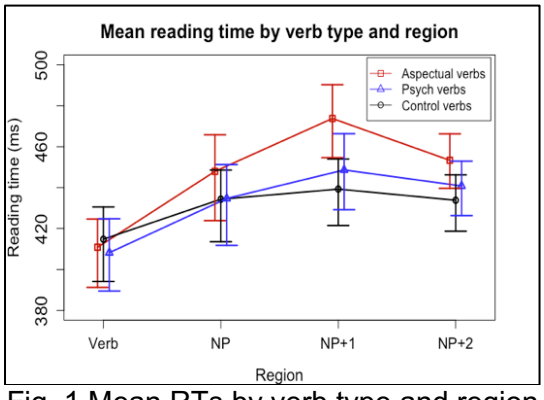

Fig. 1 Mean RTs by verb type and region

WHETHER FACE-VOICE (A)SYNCHRONY AFFECTS MULTIMODAL IDENTITY RECOGNITION BY NON-NATIVE SPEAKERS OF ENGLISH

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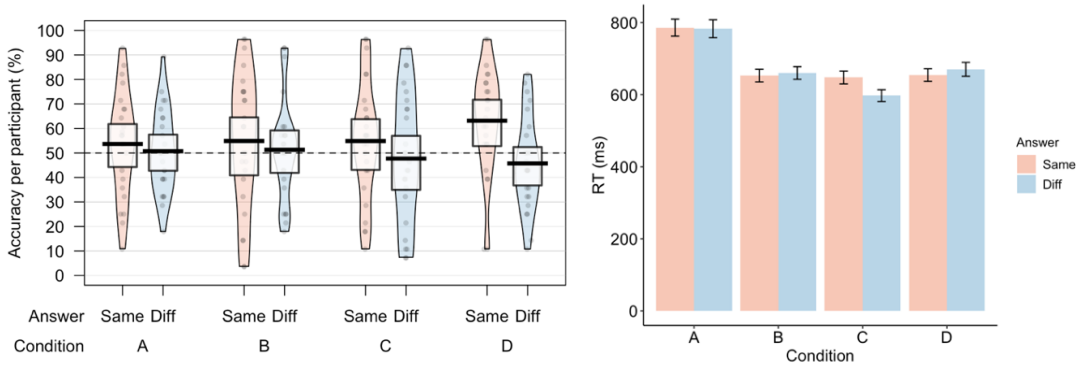
This study aimed to investigate the impacts of synchronization of face-voice information on the recognition of speakers' identity, and the perceptual patterns of non-native speakers when matching faces and voices of unfamiliar speakers. Previous research has been shown that native English speakers can match faces and voice of unfamiliar speakers at about 70% accuracy [1][2]. However, the designs of these studies did not reflect real-life scenarios in which speakers' face and voice always overlap and can involve individuals with different language backgrounds, such as participants in a video conference trying to communicate under varying levels of internet connection. To investigate the effects of time synchronization, we implemented four conditions: A. static face and voice, B. time-matched face and voice, C. voice-first and D. face-first asynchronization. To ensure comparability with previous studies [1][2], we adopted the same material design with all the contents in English. Participants were asked to determine whether the face and voice belonged to the "same" or "different" person. We then analyzed accuracy and reaction times by (a)synchronization and answer types.

Our data included 25 participants (M_{age} = 24.2, SD_{age} = 2.83, N_{female} = 16) who were Mandarin native speakers learning English as a second language. The results showed that non-native speakers achieved an overall accuracy rate of 52.74%, indicating that the task posed considerable difficulty for them. The effect of conditions on accuracy was found to be slightly higher in the face-first condition (D) than in other conditions, but the differences were not significant. It suggested that facial information being dynamic or not may not be crucial, but rather, the earlier presentation of facial information holds greater dominance in non-native listeners' identity judgements. Moreover, face-voice pairs that were identified as the "same" also reached significant higher accuracy rates than the "different" ones ($\chi^2[1] = 16.79$, $p < .001$). A significant interactive effect of condition and answer ($\chi^2[3] = 10.28$, $p = .0016$) further indicated that participants tended to perform with higher accuracy when responding the trials of "same" answers. Regarding reaction times, non-native speakers spent significantly more time to judge static faces (A) compared to other conditions (all ps < .03), indicating the challenges associated with static facial information for the purpose of identification. More data from both non-native and native speakers will be needed for further investigation.



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INTERACTION AFFECTS CHILDREN'S PERSPECTIVE-TAKING IN MULTIPLE-PARTY CONVERSATION

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Previous studies showed that 5- to 6-year-old children can take the other's perspective during a conversation (Nadig & Sedivy, 2002). The present study moves forward to explore whether younger children switch among the conversational partners' perspectives, or integrate all the partners' perspectives when there is more than one partner.

Methods: Thirty 3-year-old Mandarin-speaking children participated in the study. They sat in front of a frame with one blocked grid. The display either contained four different objects (the non-competitor condition) or two different and one pair of the same objects (the competitor condition). Experimenter 1 (E1) either sat on the same side with the participants, sharing all the objects with them (the sharing condition) or sat on the opposite side, sharing only three objects (the non-sharing condition). Experimenter 2 (E2) always sat on the opposite side (Fig 1). Either E1 or E2 instructed participants to "*point to the dog*" in each trial. The target object (e.g. "the dog") was always presented in the transparent grids, with or without the competitor in the blocked one.

Results: Supposedly, children should be less likely to choose the competitor object when E1 instructed in the non-sharing condition but should seldomly choose the competitor when E2 instructed in both sharing and non-sharing conditions, because E2 always sat on the opposite side, as E1 in the non-sharing conditions.

As predicted, for E1 items, behavior analysis showed that participants chose fewer competitor items in the non-sharing condition, compared to the sharing condition, $p<.05$. However, for E2 items, participants showed a similar pattern as in E1 items, $0<.05$ (Fig. 3).

Participants' fixation on the competitor object was also calculated across the interval of the critical noun (e.g., "dog"). In E1 trials, addressees were less likely to look at the competitor object in the blocked grid in the non-sharing condition, $p< 0.1$. However, their eye fixations on the E2 trials displayed a similar pattern to E1 trials: children are more looked at the competitor object in the grey grid when E1 sat next to them, regardless of the instruction given by E2, who always sat on the opposite side, $p< 0.1$ (Fig. 4).

Conclusion: Firstly, the difference between the sharing and non-sharing conditions in E1 trials showed that 3-year-old children can take others' visual perspectives. When E1 sat on the other side, the children would ignore the mapped objects in the blocked grid. However, the result in E2 trials showed that children integrate both speakers' perspectives and resolve the definite reference according to the integrated perspective. In sum, we propose a conversation-specific perspective-taking that children treat all their conversational partners' perspectives holistically.

Fig. 1. The sample display in the sharing (left) and non-sharing (right) conditions.

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USAGE TENDENCY AND ACCEPTANCE MATTER: EVIDENCE FROM SELF-PACED READING AND ERP DATA FOR IRONY PROCESSING

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Ironic criticism is a way of criticism, whose meaning is contrary to what is literally expressed. Existing theories of verbal irony have long ignored the roles of non-linguistic factors. To address this gap, the present study investigated how irony usage tendency and usage acceptance modulate irony processing via a self-paced reading task (Experiment 1) and the ERP technique (Experiment 2). As for irony usage tendency, the results showed that participants with low usage tendency spent more time processing ironic utterances relative to literal ones, while those with high usage tendency showed comparable reading times between literal and ironic conditions. Correspondingly, ERP results showed that those with high usage tendency elicited a smaller N400 relative to the literal condition. These findings could be accounted for by referring to the Graded Salience Hypothesis (Giora, 1997), given that irony usage tendency may largely reflect an individual's threshold salience level of ironic conceptual representations. As regards irony usage acceptance, a longer processing time of irony and a larger N400 were observed in those with high irony acceptance, suggesting that they might go through deep processing of irony and rationalize ironic criticism, according to the "two-stage process of emotional responding to irony" account (Filik et al., 2017). Moreover, though ironic utterances elicited a larger P600 than literal ones in grand average ERP waveforms, usage tendency and acceptance might not modulate the late processing of irony (i.e., integration operations), as indicated by lack of significant interactions with Utterance Type in the 500-800ms time window. The findings of this study shed light on the important roles non-linguistic factors play in irony processing, extending relevant theories and paving the way for further research.

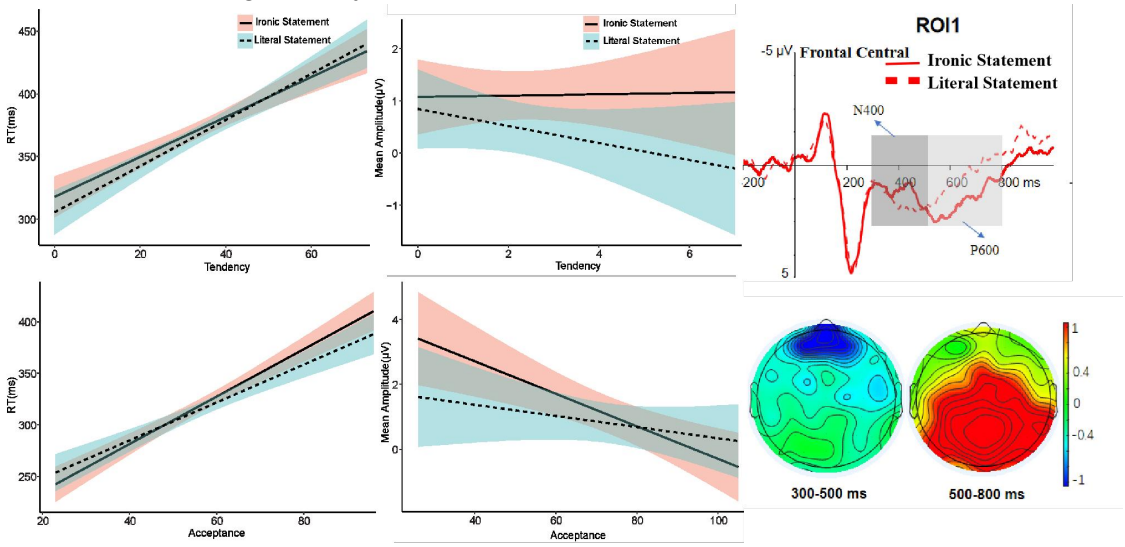

Figure1. The moderating effect of Usage Tendency and Acceptance on RTs and mean amplitudes; grand average waveforms for the ironic and literal conditions in Frontal Central and topographic distributions of difference waves (amplitudes of ironic statements minus literal statements).

THE DISAMBIGUATION AND LINGERING MISINTERPRETATION IN L1 AND L2 GARDEN-PATH SENTENCE COMPREHENSION: THE EFFECT OF INHIBITORY CONTROL

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People sometimes misinterpret temporarily ambiguous garden-path sentences (e.g., When Mary dressed the baby laughed happily.), and this misinterpretation may linger. Recent evidence shows that inhibitory control (IC) plays an important role in disambiguation. Yet, with insufficient evidence, the role of IC in the processing of garden-path sentences is still unclear. Moreover, most previous studies measured IC through a single task, ignoring the subtle differences among various tasks. Hence, this study aimed to investigate how IC ability affects L1 and L2 garden-path sentence processing, using L1 Stroop, L2 Stroop and Number Stroop tasks to increase the validity of the instruments. Garden-path sentence processing was examined using a self-paced reading task (i.e., 30 garden-path sentences, 30 non-garden-path sentences, 40 filler sentences) from two perspectives: disambiguation efficiency (as manifested by the reaction times of the critical word for correctly responded trials) and lingering misinterpretation (as manifested by the error rate of comprehension).

Forty-two Chinese learners of English were recruited, and their L2 proficiency was assessed by the Oxford Quick Placement test. Linear (or generalized linear) mixed-effects model was adopted for data analyses. The results showed longer RTs and lower accuracy for garden-path sentences compared to non-garden-path ones in both L1 and L2, echoing previous findings of the reading difficulty in the ambiguous structure and the lingering misinterpretation. Moreover, the results showed the disambiguation and lingering misinterpretation of L1 garden-path sentence processing were barely influenced by IC. However, for L2 garden-path processing, the results showed a significant three-way interaction of L2 Proficiency×Number Stroop×Sentence Type (garden-path vs. non-garden-path) in RTs analysis and a significant interaction of L2 Proficiency×L1 Stroop×Sentence Type in ACC analysis. Simple effect analyses showed that $Proficiency_{low}$-IC_{low} and $Proficiency_{high}$-IC_{high} participants showed longer RTs in the garden-path than non-garden-path condition, while $Proficiency_{low}$-IC_{high} and $Proficiency_{high}$-IC_{low} participants showed comparable RTs between the two sentence types, indicating that either high IC ability or high L2 proficiency may be the main contributor to a high efficiency in disambiguating L2 garden-path sentences. Also, simple effect analyses of ACC showed that $Proficiency_{low}$-IC_{high} participants had a larger rate of lingering misinterpretations while $Proficiency_{low}$-IC_{low} participants didn't, indicating that those with low L2 proficiency but high IC may retain misinterpretations after reading due to low L2 proficiency but possibly suppress an interfering alternative interpretation instead with high IC. Besides, this study revealed that, though all being "Stroop", the three Stroop tasks were not related to each other statistically, so they may measure different constructs, and have different predictive powers for garden-path sentence processing. Future studies should be careful when choosing a certain cognitive task.

MUSICAL PITCH PERCEPTION IN TONAL LANGUAGES OF MANDARIN AND VIETNAMESE SPEAKERS: AN ERP STUDY

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As far as the transfer effect from language to music, a growing body of literature has suggested that compared to non-tonal languages, tonal languages have more musicality property (e.g., Alenxander, Bradlow & Wong 2008; Pfordresher & Stanley et al., 2011). Tonal language speakers are considered to be comparatively biologically musical (e.g., Deutsch, 2009; Giuliano, Ngo et al., 2016; Pfordresher & Brown, 2009).

The motivation of the current study is to investigate whether speakers with more tones (Vietnamese) are more musical than speakers with less tones (Mandarin). The current study tested musical pitch perception in a MMN paradigm. The subjects were 12 Vietnamese native speakers (7 females) (M = 29.83, SD = 6.49) and 12 Chinese Mandarin native speakers (10 females) (M = 25.41, SD = 6.02) without receiving formal musical education. Four-tone pitch patterns were synthesized using Csound revised from Bidelman and Chung (2015), which has standard pattern of four tones (1200, 1800, 800, 2000Hz); contour change (1200, 900, 800, 2000Hz); and interval change (1200, 1500, 800, 2000Hz). The MMN potentials were recorded in participants in response to continuous pitch sequences with occasional contour or interval deviations in the ongoing melodic stream while participants were watching a silent subtitled movie. This study was designed as group condition (Mandarin vs. Vietnamese), pitch change (contour vs. interval deviation), cerebral hemisphere (left vs. right).

The data is under analysis currently. Our hypothesis is 1) the speakers of more tones are expected to have more enhanced music ability than the speakers of less tones; 2) both of two groups are better to discriminate contour than interval deviation because either of them is contour-tone language.

EFFECTS OF DISFLUENCY ON PRAGMATIC PROCESSING IN HUMAN-ROBOT DIALOGUES

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The occurrence of disfluencies such as “um” and “uh” in conversational speech can be interpreted as hinting unfavorable responses to requests or suggestions made by the conversational partner. For example, Schegloff (2010) noted that a “dispreferred” response to a previous turn is often preceded with “uh(m)”. In this study, we examine whether such disfluency effects also exist in human-robot dialogues. Specifically, we ask whether human listeners will process “uh(m)” markers in robot speech as a cue for disperferred responses. While there is no reason to think that robots might, like humans, hesitate or feel embarrassed for delivering an unfavorable response, previous studies suggest that humans may behave similarly in human-human and human-robot interactions (Chen et al., 2021, 2022; Cohn et al., 2019, 2020, 2021).

To test this hypothesis, we conducted two experiments, both using a cued recall task with the false memory paradigm (Brewer, 1977). In the first experiment, participants would hear multiple blocks of short, two-turn dialogues between two speakers, one male and one female. In the critical dialogues, the male speaker would make a proposal or a request for information, and the female speaker would produce a neutral response (neither favorable nor unfavorable in the verbal content), which may or may not be preceded with “uh(m)”. At the end of each block, the participant would be asked to recall the female speaker’s responses in the current block by choosing the more accurate statement for each dialogue. The second experiment adopted identical materials and procedure as the first experiment, except that participants would watch video clips of the dialogues, which would allow them to hear both speakers and to see that the female speaker is a humanoid robot, Furhat (https://furhatrobotics.com/). We predict that in both experiments, participants would remember the female speakers’ responses on critical trials **more negatively** (i.e., as dispreferred responses) when the response is preceded by “uh(m)”, compared to a completely fluent response.

A total of 123 native Mandarin Chinese speakers participated in this study (72F, 51M, aged 18-34 years old), roughly evenly split between the two experiments. The experimental materials consisted of 100 dialogues (50 critical and 50 fillers), evenly distributed in 10 blocks. The critical stimuli underwent a separate norming test to ensure that the verbal responses (not including disfluency) were indeed perceived as neutral. Auditory stimuli were recorded by two native Mandarin Chinese speakers (1F, 1M) in their 20s in a sound-proof booth. To create disfluent versions of the responses, tokens of “uh(m)” were elicited from the female speaker’s natural speech when performing a story telling task and subsequently inserted to the female speaker’s recording of the scripted dialogues at designated, utterance-initial positions. To create the video stimuli, we combined the auditory stimuli with video recordings of Furhat in the “live” mode, showing visible facial features, facial expressions and head movement while lip syncing to the female speaker’s lines in the dialogues. The video stimuli would give viewers the impression of witnessing a conversation between Furhat and a male human speaker who is not shown in the video.

Generalized linear mixed-effects models (GLMM) were built to analyze the participants’ responses in the memory recall task on critical trials. The GLMMs for both experiments revealed a significant effect of disfluency on the likelihood of remembering the response as dispreferred (Exp1: $\beta_{disfluency} = 0.52$; $p < .001$; Exp2: $\beta_{disfluency} = 0.60$; $p < .001$). When modelled together, no interactions of Experiment and Disfluency were found, showing that the disfluency effect was comparable between human-human and human-robot dialogues. These results suggest that human talkers use the same model for interacting with both humans and AIs. We discuss implications of this study in the context of prediction adjustment (or the lack thereof) based on the interlocutor.

TOWARDS JOINT MODELING OF DIALOGUE RESPONSE AND SPEECH SYNTHESIS BASED ON LARGE LANGUAGE MODEL

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This paper explores the potential of constructing an AI spoken dialogue system that *"thinks how to respond"* and *"thinks how to speak"* simultaneously, which more closely aligns with the human speech production process compared to the current cascade pipeline of independent chatbot and Text-to-Speech (TTS) modules. We hypothesize that Large Language Models (LLMs) with billions of parameters possess significant speech understanding capabilities and can jointly model dialogue responses and linguistic features.

We conduct two sets of experiments. Firstly, we showcase the speech understanding ability of LLMs by performing prosodic structure prediction, which is a typical task within the TTS text analysis front-end. Results show that both prompting-based ChatGPT and fine-tuning based ChatGLM model achieve competitive performance against traditional methods. We also show that LLM can utilize linguistic knowledge to improve prediction accuracy.

Secondly, we aim to further integrate a wide array of linguistic features into the model, and maintain LLM's dialogue capability at the same time. To address the lack of a parallel dataset of dialogue response and linguistic annotations, we employ an automated dialogue context generation approach inspired by LongForm, then train an LLM to produce both dialogue response speech features at the same time. Our results indicate that the LLM-based approach is a promising direction for building unified spoken dialogue systems.

PHONETIC, NOT SEMANTIC RADICALS, FACILITATE WRITTEN VERB PRODUCTION: EVIDENCE FROM CHINESE WITH THE PICTURE-WORD INTERFERENCE PARADIGM

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How is information transmitted across semantic and orthographic levels in written word production? There exists a consensus in the literature supporting a cascaded flow of information within the lexical system in alphabetic scripts. Given the characteristics of Indo-European languages where phonology and orthography are closely intertwined, Chinese, which adopts a distinct separability between the two, still demonstrates the generality of cascadedness. Yet, this understanding is largely based on studies in Chinese that manipulated the semantic radicals, referred to as "形旁". Taking into account that a vast majority of Chinese characters consist of both phonetic ("声旁") and semantic radicals, a sole focus on semantic radicals might not encapsulate the full complexity of the language. The semantic radical typically alludes to the character's meaning, while the phonetic radical provides pronunciation cues. This emphasis on semantic radicals in existing research raises the question of generalizability: Whether or not the semantic and phonetic radicals differently interact with the semantic system?

Furthermore, existing studies largely come from noun word production, relatively less work has explored verb production. Verbs, representing actions or states, are considered more abstract and are found to be more challenging to produce compared to nouns, which often denote tangible objects or entities. Given the inherent complexity of verbs, can finding of cascadeness based on nouns be generalized to verb production?

In our study, we probed the roles of both semantic and phonetic radicals in handwritten verb production using a picture-word interference paradigm. Chinese participants were instructed to write the names of target verb pictures while ignoring distractor words. To capture the pure orthographic effects, under all conditions, the distractors have no phonological relation to the target pictures. Each picture was paired with four types of distractor words: (1) a semantically related but orthographically dissimilar distractor (Sem); (2) a semantic related distractor, and with identical semantic radical (Sem_semantic_radical); (3) an orthographically related word with identical semantic radical, but semantically dissimilar (Orth_semantic_radical); (4) an orthographically related word with identical phonetic radical, but semantically dissimilar (Orth_phonetic_radical). Distractors within each condition were then recombined with the pictures to form four unrelated conditions. Compared with the unrelated condition, we found a significant semantic interference effect in Sem condition (1), and a significant orthographic facilitation in Orth_phonetic_radical condition (4). Moreover, we obtained an interaction between semantics and orthography under condition related to semantic radicals. Those findings indicate the distinct roles of semantic and phonetic radicals in written verb production. Our results bolster the non-discrete hypothesis in Chinese verb production, suggesting that activation operates in a cascaded manner within the written production system.

Keywords: word production; verb; picture-word interference paradigm; semantic radical; phonetic radical

DISCOURSE CONTEXT IMMEDIATELY OVERRIDES GENDER STEREOTYPES DURING DISCOURSE READING: EVIDENCE FROM ERPS

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This study investigated how local gender stereotype information interacts with discourse context during Chinese discourse reading, to shed light on how social knowledge is used in language comprehension, an issue that has not been well addressed. Event-related potentials were recorded while 47 participants read – besides 200 filler discourses of various constructions – 160 critical two-sentence discourses, in which the first sentence provided the discourse context that either introduced a gender stereotype-countering attitude towards roles, such as "*One should strive for the target job, and getting a job should not be restricted by gender*" in (1a) and (1b) in Table 1, or was neutral, as in (2a) and (2b). The second sentence contained the critical clause in which the stereotypical gender of the object noun (a role name) was either consistent or inconsistent with the gender specified by the head noun (a kinship term) of the subject noun phrase, as in "*Li's [daughter/son] became a nurse…*". The object nouns elicited a significantly larger N400 and a significantly larger late negativity (LN) for the inconsistent compared to the consistent conditions in the neutral contexts. Crucially, when the discourse context offered information countering gender stereotypes, both the N400 and LN effects were reversed, with the negativities being significantly smaller for the inconsistent compared to the consistent conditions. The reversal of the N400 effects suggests that discourse contexts can immediately override the processing of gender stereotypes, and thus readers compute discourse context and local pragmatic information simultaneously during discourse reading. Therefore, although there has been evidence for a functional priority of local (syntactic and/or semantic) phrase-structure processing over the processing of discourse contexts (Nieuwland & van Berkum, 2008, Brain and Language; Yu, Zhang, Boland, & Cai, 2015, Brain Research), local sentence-level computations do not always necessarily precede the processing of discourse contexts.

Table 1. Design and discourse examples for all four critical conditions. Examples are given in English translations of Chinese discourses. The critical words are in bold.

Condition	Example
Stereotype-countering, consistent	(1a) One should strive for the target job, and getting a job should not be restricted by gender./ After much effort,/ Li's/ daughter/ became/ a/ **nurse**,/ and now/ works very well.
Stereotype-countering, inconsistent	(1b) One should strive for the target job, and getting a job should not be restricted by gender./ After much effort,/ Li's/ son/ became/ a/ **nurse**,/ and now/ works very well.
Neutral, consistent	(2a) One should strive for the target job, and should not be afraid of difficulties./ After much effort,/ Li's/ daughter/ became/ a/ **nurse**,/ and now/ works very well.
Neutral, inconsistent	(2b) One should strive for the target job, and should not be afraid of difficulties./ After much effort,/ Li's/ son/ became/ a/ **nurse**,/ and now/ works very well.

L1 CHINESE SPEAKERS' REAL-TIME LEXICAL-SEMANTIC PROCESSING OF CHINESE NEOLOGISMS COINED BY ENGLISH-SPEAKING L2 CHINESE LEARNERS

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Abstract

Chinese neological errors are deviant, non-existent lexical forms coined by English-speaking L2 learners with incomplete lexical knowledge (Xing, 2003). Wang (2018) has examined 4 types of Chinese neologisms coined by English-speaking L2ers, including morphological substitution (e.g. *内 边>里边, inside), blended misuse between word and morpheme (e.g. *花公园>花园, park), clipping by forming a non-existent word (*古楼>古代楼阁, ancient building), and existent structure but non-existent word (e.g. *比赛会>比赛, sport meeting). However, up-to-date studies have never investigated L1 Chinese speakers' processing of different types of neological errors coined by English-speaking L2 learners from a real-time psycholinguistic paradigm. Through examining processing time, we may infer L1 Chinese speakers' lexical-semantic processing difficulty of different neological types. The scholastic inquiry is presented as to whether L1 Chinese speakers' real-time processing times are significantly different for different neological types coined by L2 learners. The study recruited 90 native Mandarin participants with at least a secondary schooling background (age range: 18-22). They were required to complete a self-paced reading with 40 independent critical sentences (4 neological types×10=40 in total) and 40 fillers operative on PCIbex Farm, followed by answering a semantically related question after each sentence. All stimuli in each experiment were aligned with the Latin square design. Unexpectedly, contrary to the hypothesis that "forming non-existent words by clipping" might trigger the longest average processing time, "morphological substitution" incurred the longest period in both critical and post-critical regions on average (mathematically, not statistically). Furthermore, post hoc multiple comparisons of ANOVA (i.e. inferential statistics) substantiates that the participants' processing times were not significantly different between any two neological types, theoretically implying that L1 Chinese users were insensitive to between-type neological discrepancies despite manifesting a relative difference in processing time on average.

The most prominent, distinguishing feature of L1 Chinese users is their sound knowledge of word-morpheme boundary and efficient strategy to parse lexical and syntactic information. They automatically view words comprising morphemes as a holistic construction and comprehend meaning on a macroscopic, contextual level. Regardless of any neological type, L1 users apply the same principle and procedure to effectively figure out any uncertain lexical meaning. They closely engage with the syntactic environment and automatically predict semantically dubious segments. Once L1 users find a cue in either the pre-critical region or post-critical region to imply the possible meaning of a neologism, they tend to search their mental lexicon to confirm an orthographically similar item that also fits in the context. Ultimately, this logical chain well accounts for L1 Chinese speakers' null statistically significant timing and insensitivity among different neological types.

ANALYTIC CHINESE CHARACTER RECOGNITION AMONG NONNATIVE SPEAKERS

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The recognition of Chinese characters or words may be holistic or analytic. The two processing strategies differ in terms of whether a character is treated as a single processing unit or processed sublexically, or in terms of whether the components of a character (strokes, radicals, stroke patterns) are processed in parallel or serially. The comparison of native and nonnative speakers in this regard has received limited attention in previous research and the results have been inconclusive. This presentation reports the results of three experiments involving three different paradigms: the stroke number effect, the priming paradigm, and a false-memory approach. Findings from all three experiments demonstrated the adoption of a more analytic strategy among nonnative speakers. Specifically, in a lexical decision task where the number of strokes was manipulated as a primary independent variable, nonnative speakers showed a stroke number effect (i.e., longer reaction time for characters of more strokes) where native speakers did not. Second, nonnative speakers showed a whole-component character priming effect with prime-target pairs such as 安-女 while no such priming effect was found among native speakers. Finally, preliminary data showed that nonnative speakers were more likely to produce a false memory effect than native speakers in character recognition. In this case, participants were shown a set of Chinese characters in the study phase and were asked to decide if they saw a character in the test phase. Nonnative speakers were more likely to produce an incorrect positive response to a character (e.g., 女) in the test phase that was not present in the study phase but was embedded in an earlier-encountered character (e.g., 安). We will discuss a) the causes of the nonnative speakers' tendency to process Chinese characters analytically, b) the relationship between analytic processing and reading development, and c) strategies to help learners transition from analytic to holistic processing.

INDIVIDUAL DIFFERENCES IN THE DISTRIBUTIONAL LEARNING AND OVERNIGHT CONSOLIDATION OF LEXICAL TONES

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This research examines how musical aptitude, pitch aptitude, Mandarin vocabulary size, and working memory (uniquely) account for individual differences in the distributional learning and consolidation of the Mandarin level-falling (T1-T4) tone pair by L1-Cantonese speakers. Distributional learning of phonetic categories is defined as learning through implicit exposure to probability distributions of stimuli (e.g., bimodal or unimodal) along a phonetic continuum (Maye & Gerken, 2002). In tonal learning studies, musicality and pitch aptitude have been implicated in the learning of L2 tones by non-tonal speakers (Wong & Perrachione, 2007). Vocabulary size was also implicated in the distributional learning of segments for L1 learners (Colby et al., 2018). However, whether pitch aptitude and musicality predict distributional learning of L2 tones for *L1-tonal* learners, and whether vocabulary size predicts distributional learning in an L2 setting, remain unknown. Moreover, newly learned tonal categories need to be consolidated[1] through overnight sleep for better retention outcomes. Working memory might play a role in the overnight consolidation of explicit declarative L2 learning by strengthening learned associative traces during sleep. It remains to be established whether working memory benefits distributional learning after overnight sleep where the training is implicit statistical in nature.

32 adult L1-Cantonese speakers (age range: 18-35; 15 males) were recruited for a distributional learning experiment on the Mandarin T1-T4 tone pair. Initial screening ensured that participants, with Mandarin proficiency self-reported as intermediate-level or below, had less than 9 years of Mandarin learning. Participants completed a pre-test, training, post-test procedure, where they were tested on the discrimination of Mandarin T1-T4 on novel carrier syllables in an ABX task, and were distributionally trained by listening to a two-peak **bimodal** continuum. After post-training test, participants were asked to come back 12 hours later for a second round of post-test (i.e post-sleep test) to measure their performance after overnight consolidation. Crucially, a battery of tests was given prior to the experiment to assess ID factors: musical aptitude was measured with the Montreal Battery of Evaluation of Amusia; pitch aptitude was measured with the pitch threshold task (just-noticeable differences of pitch contour); Mandarin vocabulary size was measured with the Peabody Picture Vocabulary Test; working memory was measured with Operation Span task.

Pearson correlation analysis ensured that there were no multi-collinearity issues among the factors. Results indicate a numerical trend of improvement following training, and significant improvement after sleep. Linear mixed-effects models were performed on learners' accuracy. Crucially, the results of posttest1-pretest revealed that pitch threshold (z=-4.03, p<.001) and Mandarin vocabulary size (z=2.04, p=.04) predicted immediate learning improvement, but not musical aptitude (see Fig. 1). The findings may imply that better lower-level psychoacoustic pitch processing abilities resulted in more effective auditory exposure during training, and that a richer L2 lexicon may have forced learners to create more detailed representations of L2 tonal categories during training. Furthermore, it shows that any effects of musicality may have been overridden by L1-tonal experience in a statistical learning setting. The results posttest2-pretest showed that working memory (z=2.02, p=.044) predicted improvement after consolidation. This finding implies that working memory may play a role in the consolidation of implicit statistical knowledge.

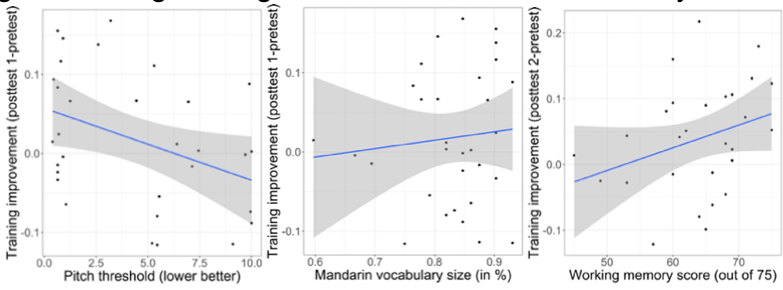

Fig. 1. Immediate training improvement (i.e. % increase in response accuracy) of individuals with different pitch thresholds (left) and Mandarin vocabulary size (middle). Improvement after consolidation of individuals with different working memory scores (right)

[1]Memory consolidation refers to the stabilization of newly learned memory traces by transformation into long-term memory.

DO BEAT GESTURES INFLUENCE AUDIOVISUAL LEXICAL TONE PERCEPTION IN MANDARIN?

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The classic McGurk effect, in which the presence of incongruent lip movements alters listeners' speech perception, highlights the importance of visual information in speech processing. Beyond articulatory visual signals, hand gestures also shape speech perception. For example, the timing of a simple downward beat gesture guides the perception of lexical stress in Dutch (Bosker & Peeters, 2021). However, no study to our knowledge has tested the effect of beat gestures on perception in tone languages. Kinematic studies showed that moving one's hands caused fluctuations in f0 through biomechanical coupling, with f0 peaking around moments of maximum hand deceleration (Pouw et al., 2020). Perhaps listeners use this information to guide audiovisual tone perception. We know Mandarin listeners use contextual information to compensate for expected f0 rises in a *contrastive* manner (Huang & Holt, 2009). That is, the same f0 contour is perceived as relatively low-pitched when it was expected to be high, but as relatively high-pitched when listeners expected it to be low (Huang & Holt, 2009). Likewise, listeners may compensate for f0 rising due to co-speech beat gestures.

In this study, we test whether beat gestures influence lexical tone perception in Mandarin. Forty-eight participants will be presented with seven-step lexical tone continua on nine Mandarin word pairs, ranging from tone 1 (high level tone; T1) to tone 2 (rising tone; T2). These continua will be combined with videos of a speaker either performing a simple downward beat gesture (gesture condition) or with hands resting on both sides of her thighs (no gesture condition). The speaker's face will be masked to eliminate any visual articulatory information. Then, the participants will be asked to indicate which Mandarin word they perceive, the word bearing T1 or the word bearing T2.

If listeners indeed expect the speaker to produce higher f0 when producing a beat gesture, they may compensate for this visual context by giving more T2 responses (compared to no gesture condition). Data collection is underway and results will be available in summer 2023. If our hypothesis is confirmed, this would provide the first evidence of perceptual compensation for biomechanical gesture-speech coupling. Thus, we aim to contribute to cross-linguistic evidence of how the timing of simple hand gestures shapes speech perception.

Reference

INTEGRATION OF MORPHOSYNTACTIC INFORMATION IN INCREMENTAL PROCESSING: EVIDENCE FROM KOREAN CONTROL SENTENCES

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In the online processing of English control constructions, such as "*John promised Mary PRO to wash,*" comprehenders immediately utilize verb information to establish the association between controller (antecedent NP *John*) and controllee (the invisible embedded subject PRO) (Boland, Tanenhaus, and Garnsey, 1990). However, in the Korean counterpart, schematized as '*John-NOM Mary-DAT PRO wash-**COMP** promise-PST-DECL,'* verb information is delayed until the end of the sentence, making immediate use of verb information impossible. Consequently, Korean comprehenders rely on alternative cues. While there is substantial evidence supporting the use of preverbal constituents in verb-final languages (Inoue & Fodor, 1995; Kamide, Yuki, Altmann, & Haywood, 2003), the extent to which these cues are used remains unclear.

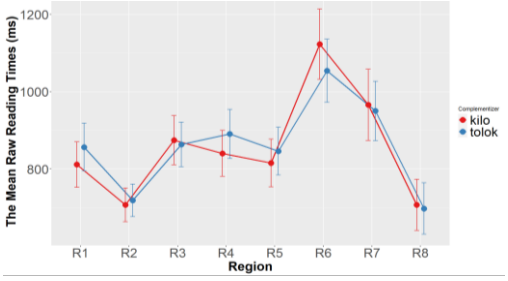
This study aims to investigate whether Korean parsers immediately utilize complementizer information in the real-time processing of Korean control sentences. Previous research by Song and Yun (2016) has shown that Korean readers use modal suffixes attached to embedded verbs in combination with control verbs as a cue to identify the referent of PRO in control constructions. However, the use of preverbal cues in the absence of verb information has not been thoroughly examined.

This study employs a stop-making-sense task (Boland et al., 1990), where participants read sentences region by region and press a rejection button to move on to the next trial as soon as they perceive the sentence to cease making sense. Notably, in Korean, complement clauses take different complementizers depending on the control verb that follows them (Gamerschlag, 2007): subject-control verbs follow the complementizer *kilo*, whereas object-control verbs follow the complementizer *tolok*. Thus, complementizers potentially play a role in the online processing of Korean control constructions.

Forty-six native speakers of Korean participated in the experiment, which employed a Latin square design crossing *Complementizer type* (*kilo* vs. *tolok*) with *Context* (Match vs. Mismatch), resulting in four conditions (*k*=8 each), alongside 64 fillers. The plausibility of the context in regions R1 through R5 was manipulated to either align (Match) or conflict (Mismatch) with the complementizer information presented in R6 by alternating the subject NP and the object NP—see (1). To examine the use of complementizer information despite the absence of control verbs, specific control verbs in the target sentences were replaced with the control-neutral verb *ha-* 'do', which can take either complementizer.

The results revealed that, for sentences judged as making sense, there was a main effect of Complementizer, with *tolok* being read faster than *kilo* (Fig.1). Furthermore, in Mismatch conditions, the neutral verb *ha-* in R7 was read more slowly compared to Match conditions. Additionally, a Context effect was observed, with Mismatch sentences exhibiting higher rates of rejection in the critical regions compared to Match sentences (Fig.2). These findings suggest that control information induced by complementizers is immediately used to guide controller choice in the online processing of Korean control constructions. Thus, preverbal morphosyntactic information can be sufficient to elicit active dependency formation, even in the absence of verb control information. (485 words)

(1) A Sample Target Sentence (*Kilo*-Mismatch Condition; translated into English)
Today $_{Region1}$ / customer-NOM $_{R2}$ / waiter-DAT $_{R3}$ / quickly $_{R4}$ / order-ACC $_{R5}$ / take-**KILO** $_{R6}$ / do-PST-DECL-COMP $_{R7}$ / say-PRS-DECL. $_{R8}$
?"It is said that a customer$_1$ decided PRO$_1$ to take an order quickly from a waiter$_2$ today."



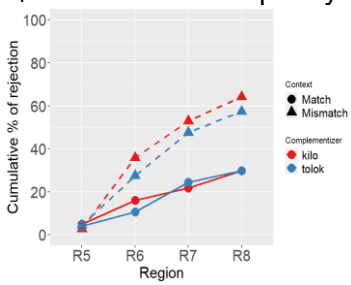


Figure 1 (left). Mean raw reading times (R6: complementizer region)

Figure 2 (right). Cumulative percentages of rejections in the critical regions (R6, R7)

NEURAL UNDERPINNINGS AND COGNITIVE CORRELATES OF HYPER-PRIMING EFFECTS IN OLDER ADULTS: ELECTROPHYSIOLOGICAL EVIDENCE FROM THE PRIMED LEXICAL DECISION TASK

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Hyper-priming refers to an increased semantic priming effect; it is typically seen in pathological groups (e.g., Alzheimer's disease), and it may be accounted for by the declining inhibition function that leads to difficulties in processing semantically unrelated information. On the contrary, it can also be attributed to improved semantic functions that may arise due to the accumulation of semantic knowledge. To clarify its neural underpinnings, a primed visual lexical decision task was conducted in younger and older adults. We hypothesize that older adults will exhibit hyper-priming in the N400 or late positive component (LPC) windows, and that a hyper-priming effect may not necessarily reflect poor cognitive performance.

30 Cantonese-speaking young adults (15F, age = 21.8, *SD* = 1.43) and 59 older adults (31F, age = 68.9, *SD* = 3.21) were recruited. All older adults were cognitively normal (HK-MoCA = 26.4, *SD* = 2.27). For the primed lexical decision task, a short SOA (150 ms) was used to promote automatic semantic processing. Also, a series of tests (e.g., Stroop, Raven, Synonym, verbal fluency) were adopted to measure various cognitive abilities (inhibition, fluid intelligence, vocabulary knowledge, controlled retrieval).

A repeated-measures ANOVA on RTs revealed significant semantic priming effects (SP) in both groups. Older adults (*M* = 28.7 ms, *SD* = 20.2) showed a significantly larger SP than young adults (*M* = 17.1 ms, *SD* = 23.5), $t(51.30) = 2.29$, $p = .026$. Analysis of cognitive correlates revealed that older adults with higher verbal fluency were more likely to show smaller SP, $r(57) = -.28$, $p = .030$, reminiscent of that found in younger adults.

For the ERP analyses, two components were analyzed—the N400 and the late positive component (LPC). For N400, both groups showed significant semantic priming effects, albeit with topographical differences between groups. In young adults, the effect, which peaked at centro-parietal sites, was positively correlated with Stroop, $r(26) = .51$, $p = .006$; this suggested that general executive functions, especially inhibition, were involved in the task. The SP effect was significantly smaller in older adults and more right-lateralized; it was positively correlated with verbal fluency, $r(57) = .25$, $p = .057$ (marginal), and negatively correlated with age, $r(57) = -.23$, $p = .079$ (marginal). In contrast, the LPC, as an index of post-control processing, only showed SP in older adults. In support of our hypothesis, the magnitude of LPC was positively correlated with Synonym, $r(57) = .34$, $p = .009$, and verbal fluency, $r(57) = .38$, $p = .004$.

To conclude, notable topographical differences in the ERP of each group suggest that potentially differing cognitive mechanisms are at play, whilst LPC effects in the older group imply more controlled processing. Also, hyper-priming is a complex phenomenon that cannot be simply understood as either semantic improvement or declining inhibition function. Instead, multiple cognitive processes are at play, with some of these processes (N400/LPC SP and amplitude) reflecting improved semantic knowledge and preserved semantic activation in older adults, even though the effect may be dominated by other processes (e.g., inhibition) in young adults.

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SENTENCE-GUIDED RETUNING OF VISUAL PHONETIC CATEGORIES IN AUDIOVISUAL SPEECH

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Speaker idiosyncrasies can affect the perception of phonemes in both auditory and visual speech. To disambiguate and learn about speaker idiosyncrasies, listeners can use lexical knowledge to determine which phoneme the speaker intended to produce and to adjust their phonetic category boundary to recognize the phoneme as intended in future encounters in both modalities (e.g., Norris et al., 2003; van der Zande et al., 2013). However, this use of lexical knowledge seems to fail in the case of idiosyncrasies in word onsets (Jesse & McQueen, 2011). Here, preceding sentence context has been shown to guide the recalibration of *auditory* phonetic categories to adapt to a speaker (Jesse, 2021). In this study, we tested whether sentence context can also retune *visual* phonetic categories. During exposure, forty participants saw and heard a speaker producing sentences. On critical trials, the final word came from an onset /p/-/t/ minimal pair (e.g., *pan* vs. *tan*), but the onset was set to be auditorily and visually ambiguous. For half of the of participants, the distal sentence context disambiguated the onset as /p/ (e.g., *Joline enjoys frying eggs for every meal. Unlike others, she never uses inferior cookware for frying.*); for the other half as /t/ (e.g., *Jolene really enjoys the sunshine. Though she never uses any sunscreen, her skin never has a rash.*). The immediate context was the same across conditions within a pair and always supported both interpretations (*Rather, she always has a nice [?]an*). Both groups categorized steps of a visual-only /pɑ/-/tɑ/ continuum before and after exposure. The /p/-group gave more /pa/ responses than the /t/-group after exposure, but not before exposure, indicating that the visual phonetic boundary was recalibrated by the distal sentence context during exposure. To summarize, the results of the present study show that sentence context can adjust visual phonetic categories to speaker idiosyncrasies during audiovisual speech perception.

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AN ERPS STUDY ON THE PROCESSING OF GERMAN PLACEMENT VERBS BY KOREAN L2 LEARNERS OF GERMAN

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INTRODUCTION The current study investigated the processing difficulty of Korean L2 learners of German using German sentences having spatial relations. In German, a verb should be differently chosen according to the angles between the target and place ('stellen' to put upright', 'legen' to put in a lying position, and 'setzen' to put in a sitting position) (De Knop, 2016). Each representation can also be mapped onto Korean verbs, such as **sey-wu-ta** to stellen, '**nwup-hi-ta**' to legen, and '**anc-hi-ta**' to setzen. However, according to Sung (2011), the verb "**noh-ta** (to put)" is preferred in Korean to express the placement regardless of the angle of the target. Therefore, we investigated whether the difference may cause difficulty for Koreans to process the German placement expressions.

PROCEDURE The brain responses of 16 Korean L2 learners of German (male 6, mean age 25.3, mean scores of proficiency test 55.2 out of 72) were recorded while they read the visually presented experimental sentences, including six conditions (Table 1), and a semantic acceptability task was followed. LL and SS condition was dealt with as a baseline (correct conditions). In the case of 'setzen', since the verb usage is too limited, we used the LZ and SZ conditions only to compare the degree of the violation to LS or SL incongruent conditions.

Table 1. Experiment conditions and material examples

Condition	Right verb	Used verb	Examples
LL	legen	legen	Maria hört, dass Peter den Teppich auf den Boden **legt.**
LS	legen	stellen	Maria hört, dass Peter die Zeitung auf den Boden **stellt.**
LZ	legen	setzen	Maria hört, dass Peter den Pullover auf den Boden **setzt.**
SS	stellen	stellen	Thomas hört, dass Anna die Lampe auf den Boden **stellt.**
SL	stellen	legen	Thomas hört, dass Anna das Fahrrad auf den Boden **legt.**
SZ	stellen	setzen	Thomas hört, dass Anna das Glas auf den Boden **setzt.**

RESULTS In the sentence acceptability task, the accuracy of SS(82%) was lower than LL(93%). Additionally, the accuracy was lower in when LS(29%) and SL(16%) conditions compared to the LZ(34%) or SZ(36%) conditions. The RT was shorter in LL(545ms) than SS(621ms) conditions, and they(LL & SS) were shorter than correct answers to incongruent conditions (LS 989 ms, LZ 1022 ms, SL 954ms, SZ 923 ms). Interestingly, the incorrect response time of incongruent conditions, i.e. RT of "Yes" answers to LS (668 ms), LZ (713 ms), SL (604ms), SZ (830 ms) was shorter than the correct response time of them, implying that the participants hesitated to determine the incongruent conditions as being not acceptable. In ERP analysis a marginally significant N400 was revealed in the central AOI in LS and LZ conditions compared to the LL condition. However, ERPs to SL or SZ was not differed from SS condition, meaning the discrimination of Korean learners to German place verbs was not completed yet, even though their German proficiency was over the intermediate level.

CONCLUSION Our results showed that processing German sentences with placement verbs was difficult for Korean L2 learners. The reason would be considered in two ways. First, the proficiency was not high enough to discriminate the usage of German placement verbs. The second reason is that the perception of place relationship varies according to the language learners natively use. In that case, it may be hard to reshape the perception and recognition of the placement relationship even if they have learned a second language for several years.

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DOES MULTILINGUALISM INFLUENCE ATTENTIONAL CONTROL IN THE FORCED-ATTENTION DICHOTIC LISTENING TASK OF CANTONESE TONE?

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It has been claimed that bilinguals exhibited an advantage in attentional control due to choosing a focused language based on the language environment and suppressing unused languages. Soveri et al. [1] examined the processing of consonants by the Forced-attention Dichotic Listening (FADL) paradigm, where participants hear two different stimuli simultaneously and report the clearer one in the Non-forced condition (NF), the left-ear stimuli in the Forced-left condition (FL) and the right-ear stimuli in the Forced-right condition (FR). Both forced conditions, especially the FR, require one's attentional control ability to accomplish, that is, to focus on one stimulus and ignore the other one. The bilingual group outperformed the monolingual group, showing larger accuracy increases in the instructed ear from NF to each Forced condition. However, the comparison between bilinguals and monolinguals overlooked the individual differences and the multilinguals [1]. It is better to consider multilingualism as a continuum, from low-degree (monolingual-like) bilinguals to high-degree (balanced) multilinguals. Moreover, the ear preference pattern of tone processing in the NF condition differs from segments (e.g., consonants) and depends on tone types [2]. For instance, Cantonese contour tones exhibited a greater right-ear advantage than level tones [3]. The tone type may influence ear preference in both forced conditions. Therefore, this study examines whether and how the tone type and, more importantly, the degree of multilingualism influence Cantonese native speakers' attentional control in the FADL task of Cantonese tone.

60 Cantonese-English bilinguals and multilinguals aged 18-25 were recruited in Hong Kong. They completed a language history questionnaire, a Cantonese tone training, and a target FADL task. Multilingual Language Diversity (MLD, based on the dominance and proficiency of all languages the participants acquired) aggregated from the questionnaire [4] measured the degree of multilingualism. The training was a contour-tone and a level-tone identification task with feedback to construct the association between tones and labels (1-6). In the FADL task, contour tone pairs (e.g., /ji2/ 'chair' vs. /ji4 / 'son'/) and level tone pairs (e.g., /ji1/ 'doctor' vs. /ji3/ 'meaning') were used as dichotic stimuli, generating 324 trials for each tone type. The duration of tones was controlled. Participants were instructed to report target stimuli according to varied conditions (i.e., NF, FL, and FR) by pressing keys (1-6). Accuracy was submitted to statistical analysis.

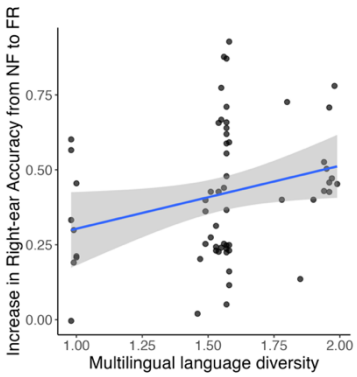

Fig1. MLD interaction with the right-ear accuracy increase from NF to FR

An ANOVA analysis showed an Tone Type*Ear*Condition interaction ($F(2,708) = 15.1$, $p<.001$). Contour tones showed a larger instructed-ear advantage than level tones in the FL and FR but not the NF, showing greater general attentional control. The asymmetry may be from the difference in acoustic cues and perceptual difficulty [3]. Linear mixed-effects analyses for the role of multilingualism (Fig.1) showed a Condition*MLD interaction ($z = 8.2$, $p<.001$) in the right-ear accuracy but not left-ear accuracy, where participants with higher MLD showed larger increases of REA from the NF to FR condition, regardless of tone types. Higher-degree multilinguals who use two or more languages more frequently and proficiently, are more capable of shifting attention to the instructed ear than their lower-degree counterparts, showing better attentional control abilities. The absent interaction in the left-ear accuracy can be explained by the less attentional demands in the FL compared with the FR. The study supported the bilingual advantage in attentional control [1] and moved forward to a multilingual level.

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A VISUAL-WORLD INVESTIGATION INTO BOUNDEDNESS IN MANDARIN ASPECT AND MIXED TELIC-STATIVE VERBS

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In Mandarin, the progressive marker *zai* indicates ongoing action, whereas the result-state marker *-zhe*$_{(R)ESULTATIVE}$ denotes the completion state of the event. With *zai*, mixed telic-stative (MTS) verbs denote a non-homogeneous bounded event with distinct stages; with *-zhe*$_R$, MTS verbs denote a homogeneous unbounded state (Li, 1990). For instance, *Akiu* ***zai*** *chuan xie* means 'Akiu is putting on shoes,' while *Akiu chuan-****zhe*** *xie* means 'Akiu is wearing shoes.'

Guo (2022) found in an offline sentence-picture matching task with MTS verbs that L1 Mandarin speakers associated *-zhe*$_R$ -sentences with pictures of unbounded events and *zai*-sentences with pictures of bounded events. According to the Event Boundedness processing-based approach, processing and predicting bounded events are more challenging than unbounded events. This is because the former, unlike the latter, involve non-homogeneous event structures that unfold in distinct temporal stages (see Ji & Papafragou, 2022 for review). However, Guo's study did not explore whether participants demonstrate such processing preferences for the mapping between events related to boundedness and aspect markers.

To test whether bounded events are more challenging to process than unbounded events, this study incorporates visual-world eye tracking into a sentence-picture matching task involving MTS verbs and the two aspect markers. The objective is to compare the gaze patterns of Mandarin speakers towards pictorial representations of bounded and unbounded events while listening to sentences with *zai* and *-zhe*$_R$. Unbounded pictures depict result-states with homogenous structures, while bounded pictures illustrate ongoing actions with partial non-homogenous structures. If longer reaction times to the two pictures is observed in the *zai* condition than in the *-zhe*$_R$ -condition, it would support the Event Boundedness processing-based approach because the former denotes a complex event. Twenty-four critical items with either *zai* or *-zhe*$_R$ were divided into two lists with 12 fillers.

Results from 80 Mandarin native speakers (so far) indicate a significant **preference for selecting** bounded pictures in the *zai* condition (90%) and unbounded pictures in the *-zhe*$_R$ condition (95%). Figure 1 illustrates the mean inspection proportions over the time course of the trials using the onset of the object as the reference point (x = 0). Log-ratios of inspection proportions were calculated to quantify the fixation bias towards the bounded vs unbounded events (Barr, 2012). A **preference for inspecting** bounded events in the *zai* condition and unbounded events in the *-zhe*$_R$ condition was observed after the onset of the object (β = .16, *se* = .041, *t* = 4.0). The log-ratio was positive for *zai*, indicating more inspections towards bounded events, while it was negative for *-zhe*$_R$, suggesting more inspections towards unbounded events. Additionally, **longer reaction times** were found between the object onset and picture selection in the *zai* condition (1750 ms) compared to the *-zhe*$_R$ condition (1350 ms), $t(204)=3.9$, $p < .001$. These findings provide support for the Event Boundedness processing-based approach.

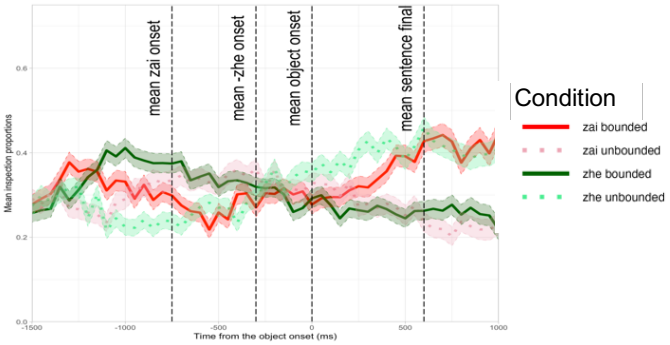

Figure 1. Mean inspection proportion (y axis) over time for each aspect marker (*zai* vs *-zhe*$_R$) and area of interest (bounded vs unbounded). Time relative to the onset of object (x axis).

REVISITING ATTENDING TO FORM DURING MEANING COMPREHENSION IN LEARNING SPANISH AS AN ADDITIONAL FOREIGN LANGUAGE

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Learners' attentional resources are limited in processing second language (L2) input. Their meaning comprehension might be inhibited if they are required to attend to form and meaning simultaneously during L2 input processing. A series of studies have tested this hypothesis but yielded inclusive findings, possibly due to variations in research modality (aural vs. written) and/or the type of form examined (lexical vs. grammatical). A recent multisite replication by Morgan-Short et al. (2018) revisited this hypothesis in both aural and written modes and generally concluded that attending to forms has no effect on meaning comprehension. However, consistent evidence for the general conclusion needs further investigation, especially for sites using the aural mode. Tentative trends from two aural sites suggest that attending to grammatical forms negatively influenced learners' comprehension. Besides, one aural site extended the research to populations learning Spanish as a third language (L3) with different first language (L1) and L2 backgrounds. Learners' prior language configurations implied cross-linguistic influences in explaining the inconsistent results as well as the need for further investigation from this aspect. Therefore, the current study aimed to further this line of research by replicating Morgan-Short et al. (2018) in the aural mode with a different learner population. The participants in this study were L1 Chinese learners who learned the target language Spanish as an additional foreign language after they had learned English as an L2. For this population, the potential cross-linguistic influence of their L1 and L2 might exhibit different effects when it comes to attending to form in their L3 since the target grammatical form has different structural proximities with that in their L1 and L2 (e.g., the article form is absent in Chinese but present in English). Specifically, participants were randomly assigned to perform one of the three tasks: 1) listening to a passage in Spanish, 2) listening to the same passage and simultaneously noting the key lexical item *sol*, and 3) listening to the same passage and simultaneously noting the definite article *la*. After the listening task, all participants took a multiple-choice comprehension test. The results partially reproduced the previous findings that attending to a lexical item (*sol*) had no effect on meaning comprehension. However, a small to medium effect was found on comprehension scores for simultaneously attending to a grammatical form (*la*). This finding revealed a site-specific effect with learners from different L1 backgrounds, suggesting that learners' attending to a grammatical form absent in their L1 is detrimental to their meaning comprehension even if this form exists in their earlier learned L2. This study expands the research in a wider Spanish-learning context and emphasizes considering cross-linguistic influences of prior learned language(s) when investigating the form-meaning relations.

Keywords: focus on form, grammar, listening comprehension, cross-linguistic influences

COGNITIVE PROCESSES UNDERLYING CHINESE CHARACTER AMNESIA: ORTHOGRAPHIC DECAY IN SEMANTIC AND PHONETIC RADICALS

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The digital age has witnessed handwriting being replaced by digital typing as a primary mode of communication, leading to a decline in handwriting literacy. This is especially worrying for writing systems that are visually complex such as Chinese, where people often have difficulty in orthographic retrieval in handwriting characters (i.e., character amnesia) [1]. While character amnesia is well-documented [2], the cognitive processes leading to its occurrence remains unclear. Recent studies have highlighted the importance of semantic and phonetic radicals in character processing [3]. In this study, we further explored whether incomplete orthographic activation in semantic and phonetic radicals contributes to character amnesia by conducting three experiments employing a priming paradigm. In Experiment 1 (73 participants and 96 target items), participants were cued with a semantic radical, phonetic radical, or an unrelated radical, then handwrote a character according to a dictation prompt (e.g., 点滴的滴 /*dian*$_3$*di*$_1$*de*$_1$*di*$_1$/, meaning “droplet from the word tiny-droplet”) and self-reported their handwriting as a correct, character amnesia, or incorrect response. In an LME model controlling for prime character stroke number, prime character frequency, semantic relatedness and sound similarity between the prime and target character, we found that, compared to unrelated radicals, phonetic but not semantic radicals significantly reduced character amnesia responses (phonetic vs. unrelated: β = -0.47, *SE* = 0.13, *z* = -3.64, *p* < 0.001; semantic vs. unrelated: β = -0.16, *SE* = 0.12, *z* = -1.40, *p* = 0.162); phonetic radicals also helped to reduce character amnesia compared to semantic radicals (β = -0.31, *SE* = 0.13, *z* = -2.36, *p* = 0.018). Experiment 2 aimed to replicate Experiment 1 (71 participants and 96 items), with the exception that participants were shown the target character before self-reporting on their handwriting in order to ensure self-report accuracy. Here, compared to unrelated radicals, both phonetic and semantic radical significantly reduced character amnesia responses (phonetic vs. unrelated: β = -0.55, *SE* = 0.15, *z* = -3.64, *p* < 0.001; semantic vs. unrelated: β = -0.50, *SE* = 0.12, *z* = -4.01, *p* < 0.001) and we did not find a difference between phonetic and semantic radicals (β = -0.05, *SE* = 0.20, *z* = -0.27, *p* = 0.787). In Experiment 3 (105 participants and 69 target items), we further examined whether semantic relatedness could inhibit orthographic retrieval [4]. The results showed that same semantic radical with semantically-related between the prime and target character (R+S+) and same semantic radical without semantically-related between the prime and target character (R+S-), significantly reduced character amnesia responses (R+S- vs. R-S-: β = -0.29, *SE* = 0.11, *z* = -2.68, *p* = 0.007; R+S+ vs. R-S-: β = -0.38, *SE* = 0.09, *z* = -4.19, *p* < 0.001; R+S+ vs. R+S-: β = 0.03, *SE* = 0.12, *z* = 0.25, *p* = 0.806). The findings that phonetic/semantic radical priming reduces character amnesia and the semantic relatedness does not suppress orthographic retrieval suggest that character amnesia is likely due to incomplete orthographic activation of radicals, which is in line with the incomplete activation account for Tip-of-Tongue [5]. Alongside the existing handwriting model [6], we introduce a new sub-lexical route for the semantics to orthography conversion. People could also utilise the importance of radicals in language teaching to better reserve handwriting literacy.

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THETA AND BETA OSCILLATIONS REVEAL LANGUAGE SPECIFIC INFLUENCES IN INFANTS' STRESS CUE-WEIGHTING

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From segmenting words to tracking hierarchical structures in natural speech, sensitivity to rhythmic patterns in speech facilitates language acquisition (see Barajas et al., 2021 for a review). While rhythm perception is modulated by listeners' prior linguistic knowledge, the extent to which it is modulated by acoustic or phonological processes, as well as the neural underpinnings of this developmental process, is not well understood.

Most studies on this topic investigated the Event-related potentials (ERPs), in particular mis-math negativity (MMN), yielding mixed findings and interpretations on the polarity and strength of the responses (Friedrich et al., 2007; Kidd et al., 2018; Kooijman et al., 2009; Ragó et al., 2021; Weber et al., 2004; Werwach et al., 2022). The limited number of studies on the neural oscillations in infants suggest that power at different frequency bands can provide indication of neural phonological sensitivity. Theta oscillations have been reported as an index for perceptual narrowing of non-native phonetic segments (Bosseler et al., 2014). Moreover, oscillatory power becomes more prominent at higher bands with development (Barajas et al., 2021). Beta synchronisation is relevant to auditory prediction in an oddball paradigm (Chang et al., 2008).

Using a multi-feature mismatch negativity paradigm, the current study investigated the event-related time-frequency responses of the weighting of pitch, intensity and duration cues signalling stress, in speech and (acoustically matched) non-speech (see stimuli and paradigm in Zeng et al., 2022) in English and Mandarin infants at 7-8 and 10-11 months. The two developmental stages were set to explore potential perceptual narrowing of lexical stress cues (Skorupa et al 2009; 2013).

Infants' time-frequency responses at theta and beta bands revealed striking cross-linguistic differences in the ***speech*** domain. English infants used all three cues at both ages, whereas Mandarin infants showed sensitivity to pitch and intensity (but not duration) in the younger age and diminished sensitivity to all three stress cues when older. These results are in line with the perceptual narrowing process, providing strong evidence suggesting that the infant phonological system is heavily involved in the processing of acoustic changes in stress cues, even when these cues are not strictly categorical.

When listening to the ***non-speech*** cues, both English and Mandarin infants showed increased sensitivity to cues with age. No obvious perceptual narrowing comparable to that in the speech domain was observed. Nonetheless, there was limited cross-linguistic difference, such that English infants and Mandarin infants showed sensitivity to differing cues at the younger age. English infants focused on intensity and duration at 7-8 months. Meanwhile, age-matched Mandarin infants tended to pitch and intensity. At 10-11 months, English infants' sensitivity to pitch cues and Mandarin infants' sensitivity to duration cues are evident, reflecting late sensitivity for these cues. These results suggest that attunement to differing cues may point to the level of familiarity with the cues employed in phonological processing, which may mildly modulate the acoustic processing in a neighbouring auditory domain.

PROCESSING CLOSEST AGREEMENT WITH DISJUNCTION SUBJECTS

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Agreement with disjunction subjects in English can target the linearly closest disjunct NP (NP2) as shown in (1). This type of closest agreement (CA) is at odds with the traditionally assumed hierarchical structure. Keung and Staub (2018), among others, argue that a construction specific rule is available for disjunction subjects that the linearly closer NP can control for agreement. In addition, plural agreement is also available under disjunction as a default strategy (Foppoloa and Staub 2020). On the other hand, phenomena involving agreeing with a closer target like agreement attraction (2) are handled by sentence processing mechanisms like cue-based retrieval. However, Keung and Staub (2018) have shown that CA in (1) does not have the same properties as agreement attraction in (2). Thus it is unclear how closest agreement is processed.

(1) The twins or Mary is/are going... (2) *The key to the doors are going...

We propose a cue-based retrieval approach to CA. The singular verb triggers search for the agreement targets specified as [+Subj, +SG]. In the context of disjunction subjects, both NPs within the disjunction are specified as [+Subj]. When NP1 is PL and NP2 is SG, the retrieval mechanism ignores the feature of NP1 due to its weakened representation in memory, resulting in CA. This approach predicts that the presence of intervening materials between NP1 and NP2 would further facilitate closest agreement with NP2, as the representation of NP1 would be further weakened. Our experiment confirms prediction.

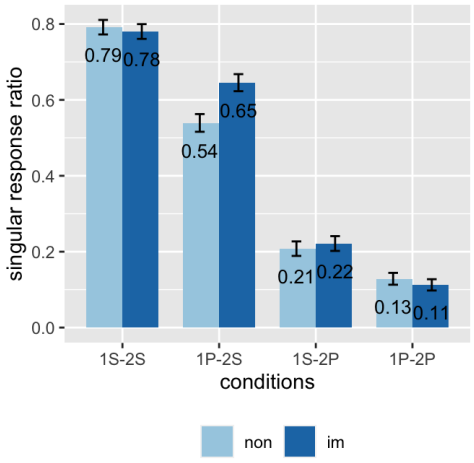
Experiment We conducted a 2-alternative-forced-choice (2AFC) experiment with 48 English speakers. Three factors were manipulated: 1. number of NP1 (1S v. 1P); number of NP2 (2S. v. 2P); intervening material (non v. im). See (3) for the conditions. (A follow up experiment with definite article *the* yielded the same results.)

(3) a. These moons (rising pretty slowly) or those stars shining brightly (1P.2P.im/1P.2P.non)
b. These moons (rising pretty slowly) or that star shining brightly (1P.2S.im/1P.2S.non)
c. This moon (rising pretty slowly) or those stars shining brightly (1S.2P.im/1S.2P.non)
d. This moon (rising pretty slowly) or that star shining brightly (1S.2S.im/1S.2S.non)

The disjunction subjects were presented word by word at 250 ms, after which the participants are instructed to choose between a singular and a plural verb (*is* v. *are* or *was* v. *were*) as the continuation. Each participants saw 10 items per condition, yielding 80 test items, plus 160 fillers.

Results and discussion The singular response ratio is shown in Figure. Given the availability of the default PL agreement under disjunction, the only unambiguous CA case is SG agreement with a 1P-2S disjunction. The results are thus analyzed as two 2*2 designs (2S conditions v. 2P conditions).

Generalized linear mixed effect models were constructed with number of NP1 and intervening materials as fixed effect. Looking at 1S-2S and 1P-2S conditions, the proportion of singular responses decreases if the first noun is plural ($p < .0001$). Crucially, there is a significant interaction between number of NP1 and intervening materials ($p < .001$). The singular ratio (i.e. CA) increases when there is intervening material between NP1 (PL) and NP2 (SG), but not between NP1 (SG) and NP2 (SG). In other words, the effect of plural NP1 on CA is reduced by the presence of intervening material, as is predicted.



PREDICTION ENHANCES STRUCTURAL PRIMING IN SECOND LANGUAGE WRITTEN PRODUCTION

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A recent study showed that predicting the upcoming structure led to greater structural priming effects (Grüter *et al.*, 2021). It remains unclear; however, what mechanisms underlie this increased priming effect. We conducted two experiments to explore this issue.

Expt 1 was a norming study in which we measured the biases of 22 English ditransitive verbs among 512 Chinese learners of English. For each verb, two different pictures (involving different thematic roles) were constructed. Each participant provided a written description of a given picture. The results showed that 16 verbs were biased towards prepositional-object (PO-biased) and 6 were biased towards double-object construction (DO-biased), indicating that Chinese learners of English have an overall bias towards PO.

In Expt 2, we investigated whether forced prediction resulted in greater structural priming and whether this tendency was modulated by the computation of prediction error. Prediction error was operationalized as the congruency between the verb bias and the prime structure it appeared in. Other things being equal, a PO-biased verb appearing in DO results in more prediction error relative to when it appears in PO. The prime verb bias was based on the results of Expt 1. We adopted a pretest-priming-posttest design, with the post-test immediately following the priming phase. Given that DO is the less preferred structure for Chinese learners, and in light of inverse preference effect, we only examined the priming of DO. We selected 16 ditransitive verbs from the 22 verbs in Expt 1. Four PO-biased verbs served as the target in the pretest and posttest. Each verb appeared twice in each phase with different pictures. Each target picture was paired with an intransitive prime. The priming phase contained four PO-biased verbs as the target, each appearing four times. For the prime verb, two sets of material were constructed. One set involved four strongly PO-biased verbs and the other set involved four DO-biased verbs. Each prime verb appeared four times, each time with a different picture. There were 78 sentence-picture pairs serving as fillers, consisting of intransitive and simple transitive events. 120 Chinese learners of English (79 females; mean age = 22.08) were randomly assigned to one of three groups. In the repetition group (N = 40), participants were instructed to read and retype Wendy's (a virtual partner) descriptions and then describe the target picture using the verb provided. In the two prediction groups (N = 80), participants first predicted Wendy's description of the prime picture, compared their prediction with Wendy's actual descriptions, and finally described the target picture. The prediction groups consisted of a congruent group (N=40; the prime structure was congruent with the verb bias) and an incongruent group (N=40; the prime structure was incongruent with the verb bias). This allowed us to explore whether the increased priming under the prediction condition was mainly due to the computation of prediction error. If the increased priming was due to prediction error, then the incongruent group should exhibit greater priming than the congruent group.

The results showed that across all three groups, there were significant increases in the use of DOs in the priming phase (b = 5.576, SE = 0.506, p < .001) and posttest (b = 7.364, SE = 0.615, p < .001) relative to the pretest, suggesting that significant immediate priming, as well as longer-term priming, occurred for all groups. The interactions between group (repetition vs. the two prediction groups) and phase were significant between the baseline and the priming phase (b = -2.371, SE = 0.864, p = .0006) as well as between the baseline and the posttest (b = -4.136, SE = 1.085, p < .001), suggesting that the two prediction groups exhibited greater priming than the repetition group. There was no difference between the congruent and incongruent groups from the baseline to the priming phase, z = 1.565, SE = 0.951, p = .100, or from the baseline to the posttest, z = 1.707, SE = 1.198, p = .154, suggesting that prediction error was not the primary cause of the enhanced priming in the prediction condition. Rather, prediction enhances priming via other mechanisms, such as increasing participants' motivation, encouraging deeper processing and/or explicit memory of the prime structure.

EXAMINING CHATGPT'S GRAMMATICAL INTUITION: CONVERGENCE WITH LINGUISTIC EXPERTS AND LAYPEOPLE

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Large language models (LLMs) have demonstrated exceptional performance across various linguistic tasks [1,2]. However, it remains uncertain whether LLMs have developed human-like fine-grained grammatical intuition. This preregistered study (https://osf.io/t5nes) presents the first large-scale investigation of ChatGPT's grammatical intuition, building upon previous research [3] that examined the grammaticality judgment of 148 linguistic constructions with varying degrees of acceptability for humans (e.g., 1a. "he was the judge" vs 1b. "he was judge"). These constructions were sampled from the journal of *Linguistic Inquiry* published between 2001 to 2010. Linguists had classified these constructions as grammatical, ungrammatical, or marginally grammatical, and their grammatical acceptability was assessed by layman participants.

In this study, our primary focus was to explore ChatGPT's judgments of these constructions in comparison to both layman participants and linguistic experts. The experimental design followed the methodology outlined in [3], with each item being tested across 50 runs. In Experiment 1, we presented to ChatGPT a reference sentence with a pre-assigned acceptability rating (e.g., 100) and asked it to assign a rating (in multiples of the reference rating) to a target sentence. In Experiment 2, we asked ChatGPT to rate the grammatical acceptability of a target sentence on a 7-point scale (1 = "least acceptable" and 7 = "most acceptable"). In Experiment 3, we presented ChatGPT with a pair of sentences (such as 1a and 1b) and asked it to decide which is grammatically more acceptable. The data from ChatGPT was combined with the human data from [3] for subsequent analyses.

Overall, our findings demonstrate convergence rates ranging from 73% to 95% (depending on the experiment and statistical test) between ChatGPT and human linguistic experts, with an overall point-estimate of 89%. This means that, in general, ChatGPT correctly distinguishes grammatical sentences from ungrammatical ones approximately 89% of the time. However, the behaviour patterns of ChatGPT and layman participants varied depending on the specific judgement task. While ChatGPT provided lower rating scores for ungrammatical sentences (β = -0.91, CI = [-0.97, -0.86]) than grammatical sentences in the magnitude estimation task, the differences in rating scores between the two were not as big as those observed among the layman participants. Furthermore, ChatGPT exhibited higher accuracy in the force choice task compared to the layman participants (β = -18.1, CI = [-21.69, -14.98], with ChatGPT being the baseline). Notably, significant differences between ChatGPT's judgments and those of human non-experts were observed in both the magnitude estimation (Experiment 1) and force choice (Experiment 3) tasks, whereas no such difference was found in the Likert scale task (Experiment 2). We attribute these results to the psychometric nature of the judgment tasks and the differences in the representation of grammatical knowledge between humans and LLMs.

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Semantic Plausibility Elicited by Semantic Anomalous but not Reversed Thematic Roles: Evidence from the Inverted Resultative Construction in Chinese

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Abstract: Language processing is inseparable from two significant language-sensitive components–the N400 and P600. Traditionally, P600 effects are elicited when the syntax of the sentence is violated while N400 effects are excited when the semantics of the sentence is violated. Strikingly, it has been found that some syntactically correct but semantically anomalous sentences also elicited P600 rather than N400. This peculiar P600 caused by semantic anomalies is normally called "Semantic P600". Thematic role and plausibility are considered to be two of the main influences on the production of Semantic P600. However, the stimuli used in previous studies have often both reversed thematic role and violated semantic plausibility (‘*The cat that from the mice fled, ran through the room.*’), making it impossible to distinguish which one of the factors contributes more to the production of Semantic P600. This paper uses a particular Chinese structure, the inverted resultative construction, which reverses thematic roles but is semantically plausible(‘*青草吃肥了羊儿-The grass was eaten by the sheep, so the sheep became fat.*’), to test which one of that thematic roles or plausibility contribute more to the emergence of Semantic P600. This particular sentence structure begins with an inanimate thing as the agent, ends with an animate thing as the object, and is joined in the middle by a verb and a resultant complement. The stimulus material was categorized into four different conditions, with the two factors of semantic plausibility and thematic role reversal crossed two by two to form a total of 200 sentences (note: Condition 1 is the baseline and Condition 3 is the Inverted Resultative Construction in Chinese). Stimuli were presented to participants word by word and the subjects were asked to make an acceptability judgement at the end of a sentence. Behavioral results showed good semantic acceptability of the Inverted Resultative Construction by native Chinese speakers (average 83.7% correct for 37 participants), and ERP results illustrated that this type of sentence excited N400 rather than P600 at critical words. These results suggested that it seems to be semantic plausibility that contributes more to the production of Semantic P600.

Key words: Language comprehension; N400; Semantic Illusion; Semantic P600;Inverted Resultative Construction; Chinese

SYNTACTIC REPETITION DURING SIMULTANEOUS INTERPRETING AND CONSECUTIVE INTERPRETING

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During interpreting, interpreters take the source language (SL) message and encode it as faithfully as possible in the target language (TL). In some cases, they do this as they listen to the SL message unfold (simultaneous interpreting, SI); in other cases, they first listen to the source language message, and then subsequently re-express it in the TL (consecutive interpreting, CI). Understanding how people map from an utterance in one language to an utterance expressing the same meaning in another language can inform models of bilingual language production. But the processes underlying these two forms of interpreting are not well understood. We reported three experiments in which interpreters-in-training heard SL sentences in Mandarin Chinese and interpreted them into English.

Exp1 investigated syntactic relationship between the SL and TL sentences during CI and SI. We manipulated the SL utterance structures so that the experiment items included either a DO or PO clause. We found reliable cross-linguistic priming effects in both CI and SI, as more DO were produced after DO than after PO in SL structure ($p<.001$), and vice versa. Importantly, the magnitude of priming effect was higher in SI than in CI, reflected in a higher rate of SL structural repetition.

Exp2 investigated the effect of TL syntactic complexity on syntactic priming during CI and SI. We manipulated the SL structures so that the experiment items included a noun phrase either with four Pre-Nominal Modifiers (e.g., *We gave the strong, healthy and intelligent mathematics teacher a watch*, Pre-N) or four Post-Nominal Modifiers (e.g. *We gave the mathematic teacher a watch, who's very strong, healthy and intelligent,* Post-N). Post-N is relatively simpler to produce due to heavy-shifting tendency. We found the magnitude of priming effect for Pre-N construction was higher in SI and CI ($p<.001$). SI mostly retained the SL structures, whereas many Pre-N SL utterances were interpreted into the less complex Post-N in CI.

Exp3 investigated the effect of SL syntactic complexity on syntactic priming during CI and SI. We manipulated the SL structures so that one third of the experiment items included a noun phrase with two Pre-N, one third with three Pre-N and one third with four Pre-N. We found that in SI, the structural repetition rate was not affected by SL syntactic complexity ($p>.05$), but in CI, the magnitude of repetition was the lowest in the long source, followed by medium source and was the highest in short source ($p<.001$). Thus, the more complex the SL sentence was, the more likely it was interpreted into the less complex Post-N in CI.

Conclusion: During interpreting, people regenerate syntax with the tendency to repeat SL syntax due to cross-linguistic syntactic priming. But people generate syntax incrementally, and SI interpreters process segment-by-segment and thus SI production is more constrained by SL. Moreover, the processing load of segments is not affected by the overall SL or TL syntax and the structural repetition in SI is independent of SL or TL structural complexity. Conversely, CI interpreters generate the TL utterance based on the concept representation of the whole sentence. Speech reformulation is costly, and thus they tend to simplify the complex syntax. Therefore, both the SL and TL syntactic complexity affect the repetition during CI only.