The effects of cross-script semantic representations in Sino-Korean processing

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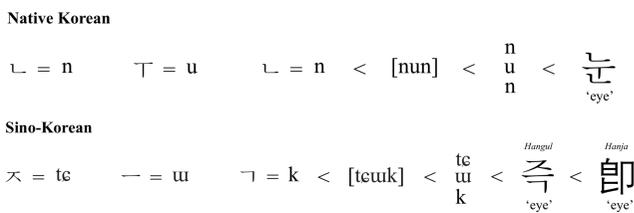### Language and Brain Laboratory, University of Oxford

Introduction

Korean uses both an alphabetic and a logographic script:

- **Hangul** – the native Korean alphabet (alphabetic syllabary)
- **Hanja** – borrowed Chinese characters incorporated into Korean according to Korean phonotactics (logographic)

As an **alphabetic** system, individual **Hangul** characters represent sounds (phonemes), and thus do not alone encode any semantic content.

As a **logographic** system, individual **Hanja** characters represent a word or phrase, thereby directly encoding meaning.

All Korean words can be written in Hangul, but not all can be written in Hanja:

Native Korean

ㄴ = n   ㅜ = u   ㄴ = n   <   [nun]   <   n u n   <   눈
'eye'

Sino-Korean

ㅈ = tɕ   ㅡ = ɯ   ㄱ = k   <   [tɕɯk]   <   tɕ ɯ k   <   즉 (*Hangul*)   <   卽 (*Hanja*)
'eye'   'eye'

Different combinations of Hangul characters create 2,000 distinct syllables, but Sino-Korean words use only 440 of the possible combinations, resulting in **repeated use of the same syllable to represent different meanings in Sino-Korean.**

There are <u>two</u> important implications:

(1) The same Sino-Korean one-syllable morpheme [hak] maps onto the semantics of two different Hanja characters ('learning' and 'harm').

[hak]

Hangul   학

학교 [hak.gjo] 'school'   학대 [hak.dɛ] 'abuse'

Hanja   學 'learning'   虐 'harm'
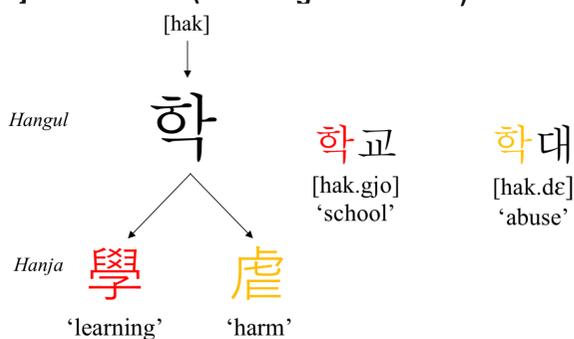
(2) Depending on the Sino-Korean morpheme, there can be relatively more or fewer semantic mappings to different Hanja characters, creating different cohort (Marslen-Wilson, 1987) sizes:
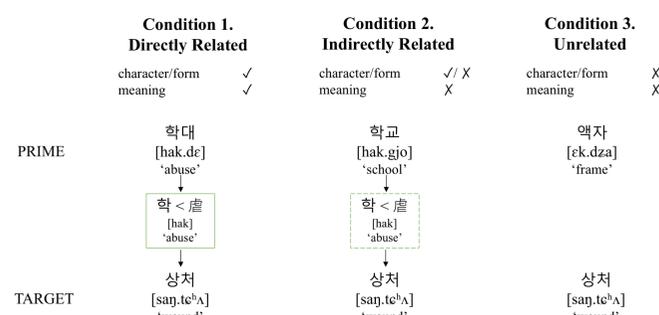
[mi]

Hangul   미

Hanja   米 'rice'   美 'beauty'   未 'not'   味 'taste'   迷 'deceive'
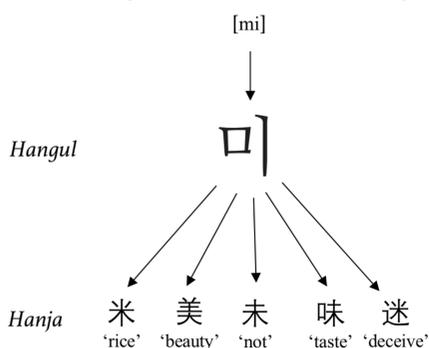
Research Questions

1) Does the relative number of encoded meanings **(semantic cohort)** modulate semantic access given the potentially numerous semantic representations?

2) Are certain meanings within the cohort more or less salient? If so, how does semantic salience interact with size of the semantic cohort?
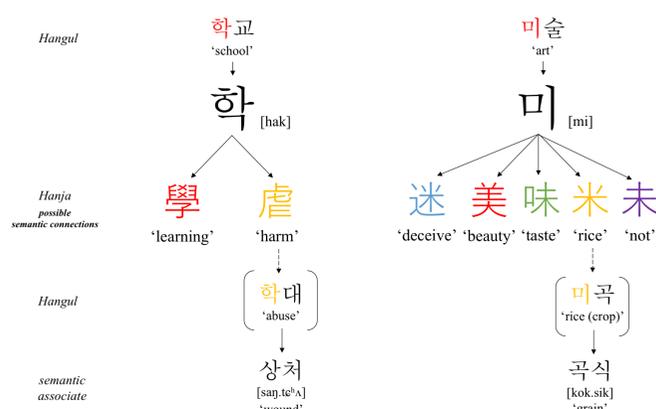
Experimental Design

- Lexical decision task using mediated semantic priming, with two-syllable, bimorphemic Korean primes and targets.

- Primes were Sino-Korean words, containing a homographic morpheme with more than one meaning.

- Primes were presented either visually or auditorily, and participants were asked to respond to only the target items.

Experimental conditions

	Condition 1. Directly Related	Condition 2. Indirectly Related	Condition 3. Unrelated
character/form	✓	✓/✗	✗
meaning	✓	✗	✗
PRIME	학대 [hak.dɛ] 'abuse'	학교 [hak.gjo] 'school'	액자 [ɛk.dza] 'frame'
	학 < 虐 [hak] 'abuse'	학 < 虐 [hak] 'abuse'	
TARGET	상처 [saŋ.tɕʰʌ] 'wound'	상처 [saŋ.tɕʰʌ] 'wound'	상처 [saŋ.tɕʰʌ] 'wound'

- 1 **intra-modal**, visual-to-visual study; *n = 189*
- 1 **cross-modal**, audio-to-visual study; *n = 197*

Exploring semantic cohort size as a continuous variable

Hangul   학교 'school'   미술 'art'

학 [hak]   미 [mi]

Hanja possible semantic connections   學 'learning'   虐 'harm'   迷 'deceive'   美 'beauty'   味 'taste'   米 'rice'   未 'not'

Hangul   학대 'abuse'   미곡 'rice (crop)'

semantic associate   상처 [saŋ.tɕʰʌ] 'wound'   곡식 [kok.sik] 'grain'

Primes crucially varied according to the relative number of semantic meanings available to the Sino-Korean morpheme of interest.

Exploring semantic salience

A separate set of participants were asked to judge whether the two meanings were (1) equally salient, or (2) of the two, one was more or less salient. These ratings were then coded for in the analysis.

Results

Intra-modal findings
Visual presentations of full words did not yield any significant results.

Cross-modal findings
Effects of semantic cohort size
Only auditory presentation of Sino-Korean full words resulted in significant results – semantic cohort-induced effects were found in the Indirectly Related condition, whereby every additional semantic mapping to a different Hanja character speeds up semantic processing (left panel).
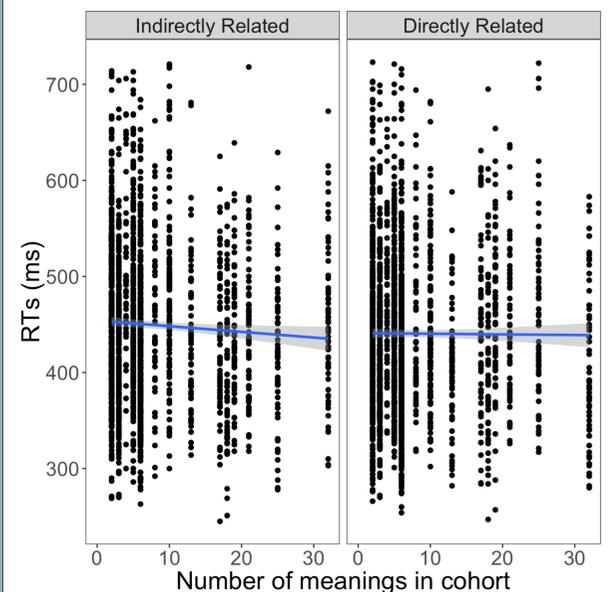
Effects of the interaction between semantic cohort size and semantic salience
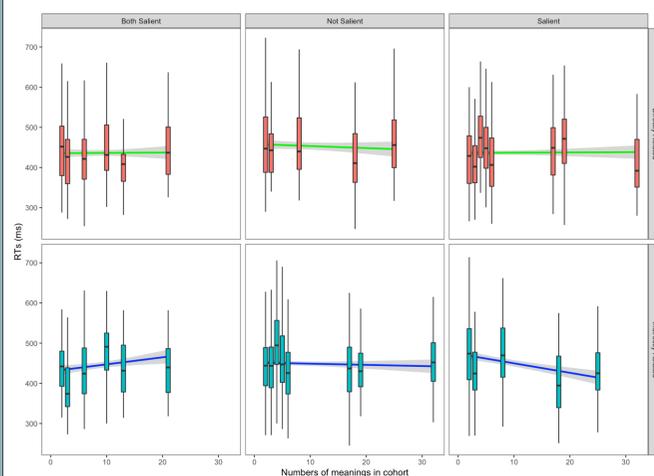
No significant interaction emerges between semantic cohort size and semantic salience, possibly due to the uneven distribution of items, but broadly, in the Directly Related condition, reaction times appear stable across increasing cohort sizes, even when meanings were more or less salient, while less so in the Indirectly Related condition.

Discussion

- Collectively, findings suggest that the **semantic contributions of Hanja play an active role** in Sino-Korean processing.
- Semantic access is bolstered by larger semantic cohorts, i.e., more available meanings, but unaffected by degrees of salience.

Selected References

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