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Morphological Activation in L1 and L2 Derived Word recognition

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Outline

- ✳ Research background
  - —Theories of L1 morphological processing
  - —Theories of L2 morphological processing
- ✳ Research Gaps
- ✳ Pilot study and results
- ✳ Next step

Morphology: Word formation

	Inflection	Derivation	Compounding
Definition	Modification of words to modulate grammatical features (e.g., tense)	Adding affixes to the stem/root to create new words	Combining existing words to create new word
Characteristics	• Do not change meaning • Combination of free and bound morphemes	• Change word meaning • Combination of free and bound morphemes	• Change word meaning • Combination of two or more free morphemes
Examples	English: teachers Mandarin: 老师们	English: worker Mandarin: 画家	English: black+board Mandarin: 黑+板

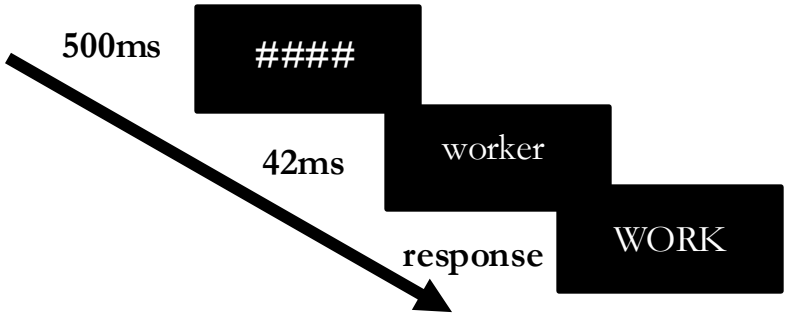
Morphological processing

- Are morphologically complex word stored as a whole or as constituent units?
- If complex words are activated by smaller morphological units, how is this process instantiated in the brain?

Theories of L1 morphological processing

Priming paradigm

- Priming effect (PE): Prior exposure to a prime word can either facilitate or inhibit the recognition of a subsequent target word.
- SOA (Stimulus onset asynchrony): Time interval between onsets of the prime and target.



Rastle et al., (2004) *Psychonomic Bulletin & Review*

Semantically transparent vs. opaque words

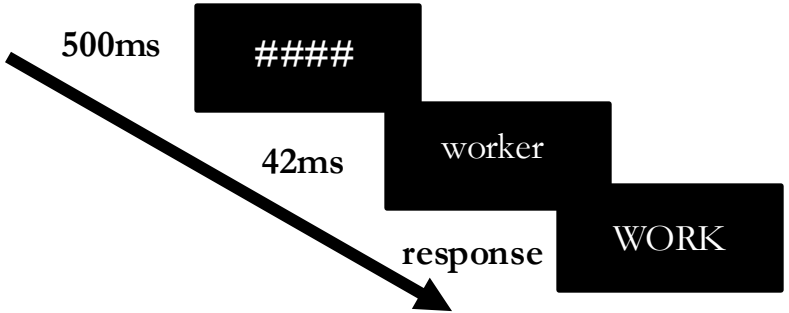
- **Transparent Word:** Fully semantically compositional e.g., "WORK-ER"
- **Opaque Word:** Relatively semantically non-compositional e.g., "APART-MENT"

	Related	Unrelated	Effect
Transparent	speaker–SPEAK (M+, S+, F+)	hurtful–SPEAK (M-, S-, F-)	Transparent PE
Opaque	corner–CORN (M-, S-, F+)	editor–CORN (M-, S-, F-)	Opaque PE
Form	scandal–SCAN (M-, S-, F+)	clearly–SCAN (M-, S-, F-)	Form PE

Semantic transparency effect
= Transparent PE – Opaque PE
= M+, S+

Probing morphological processing with the semantic transparency effect

Participants: 62 English adults
Task: lexical decision task



	Transparent	Opaque	Form
Related Prime	570	598	635
Control Prime	597	620	639
Priming Effect(PE)	27 *	22 *	4

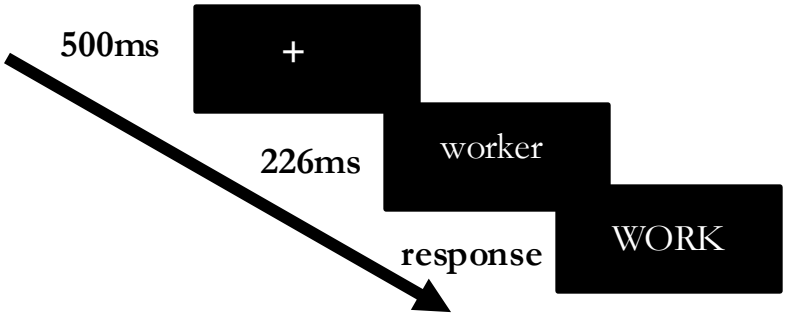
Rastle et al., (2004) *Psychonomic Bulletin & Review*

Probing morphological processing with unmasked priming

Masked Priming	Unmasked Priming
Prime is presented very briefly (e.g., 30-60ms)	Prime is presented at a relatively long exposure
Prime masked by either a forward or backward mask, or both	Prime is not masked
Automatic, subconscious sub-lexical processing	Deeping levels of prime processing for activating higher level morphological representations

Probing morphological processing with semantic transparency effect

Participants: 14 English adults (6M, 8F)
Task: lexical decision task



In unmasked priming, we can detect a semantic transparency effect.

	Transparent (cleaner-CLEAN)	Opaque (corner-CORN)	Form (scandal-SCAN)
Related Prime	663	717	805
Control Prime	754	761	807
Priming Effect(PE)	91 *	44 *	2

Lavric, Rastle, Clapp (2011). *Psychophysiology*

Theories of L2 morphological processing

Do L2 readers perform similarly or differently in morphological processing during derived word recognition?

Previous L2 research only adopted masked priming.

- Two theoretical views:

- L2 readers largely adopt the same processing strategies (morphological structure) as native speakers, but with slower speed (Diependaele et al., 2011).

- L2 morphological processing differs in more fundamental ways from L1 processing (Heyer & Clahsen, 2015).

Research Gaps in L1 vs. L2 Derived Word Recognition

Morphological Representation (Unmasked Priming)

- Role of morphemes in lexico-semantic retrieval of derived word recognition remains underexplored in L2.
- **L1 vs. L2 Comparison:** Are mechanisms of morphological activation similar or different?

Individual difference: How do L2 proficiency and morphological awareness affect morphological activation during early derived word recognition in L2?

Research question and hypothesis

Research question: How are L1 and L2 speakers similar and different in morphological activation during the initial stages of word recognition?

Hypothesis: L2 readers employ processing strategies **similar** to those of L1 native speakers; however, they exhibit **slower morphological activation** compared to their L1 counterparts.

If the hypothesis is true, then for both natives and L2 readers at short SOAs (i.e., 50ms, 83ms, & 116 ms):

- Transparent PE > Opaque PE
- Semantic transparency effect may be observed at shorter SOA for natives than L2 speakers.

Pilot study: incremental unmasked primed lexical decision task

Three SOAs: 50ms, 83ms, 116ms

	Related	Unrelated	Effect
Transparent	speaker–SPEAK (M+, S+, F+)	hurtful–SPEAK (M-, S-, F-)	Transparent PE
Opaque	corner–CORN (M-, S-, F+)	editor–CORN (M-, S-, F-)	Opaque PE
Form	scandal–SCAN (M-, S-, F+)	clearly–SCAN (M-, S-, F-)	Form PE

Pilot study: stimuli properties

Across different transparency types, the related prime-target pairs are matched on the key lexical properties.

Characteristics	Transparent	Opaque	Form-related
Targets			
Log word frequency	2.87(0.62)	2.74(0.88)	2.77(0.81)
Orthographic neighborhood size	8.44(5.69)	9.19(7.20)	9.04(5.35)
Phonological neighborhood size	19.15(13.89)	18.95(14.15)	19.10(13.60)
Word Length	4.21(0.75)	4.36(0.88)	4.27(0.56)
Primes			
Log word frequency	2.22(0.63)	2.31(0.83)	2.26(0.75)
Orthographic neighborhood size	1.79(2.14)	1.98(2.21)	1.64 (1.96)
Phonological neighborhood size	4.02(5.22)	4.22(4.63)	3.57(4.88)
Word Length	6.58(1.15)	6.72(1.14)	6.55(0.94)
Orthographic prime-target overlap	0.65(0.10)	0.65(0.10)	0.66(0.09)
Semantic prime-target relatedness	0.51(0.17)	0.07 (0.07)	0.07 (0.07)

Transparent condition generated a significantly higher semantic relatedness values than those in the opaque condition, $t(214) = 25.08$, and form-related condition, $t(211) = 24.83$, while no difference was found between the latter two conditions, $t(211) = 0.40$.

Pilot study: Experimental design

- **English proficiency measures:**
  - Language History Questionnaire (LHQ-3) (Li et al., 2020)

- **Morphological awareness measures:** Test of morphological structure (Carlisle, 2000)

Part 1: Derivation

Practice a. Farm. My uncle is a _____. [farmer]

b. Help. My sister is always _____. [helpful]

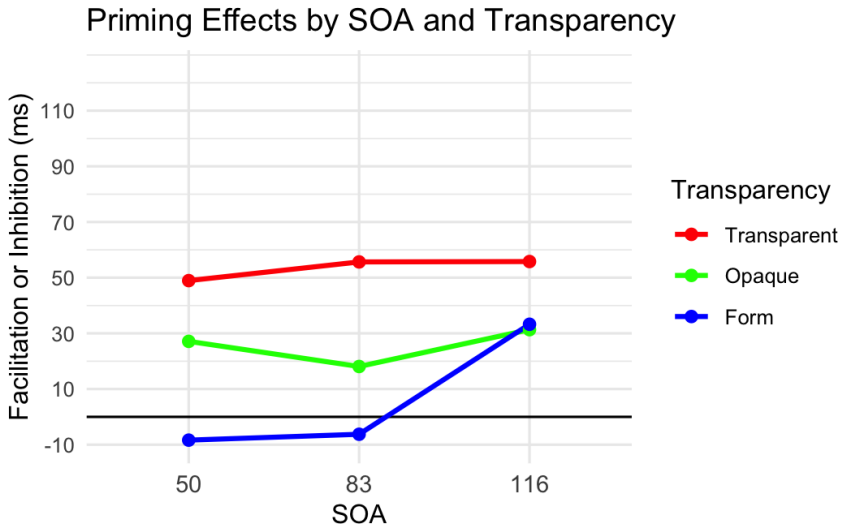
Part 2: Decomposition

Practice: a. Driver. Children are too young to _____. [drive]

b. Improvement. My teacher wants my spelling to _____. [improve]

Pilot results: incremental unmasked primed lexical decision task

A pilot study of 12 English natives (7M, 5F, Mean age=20)



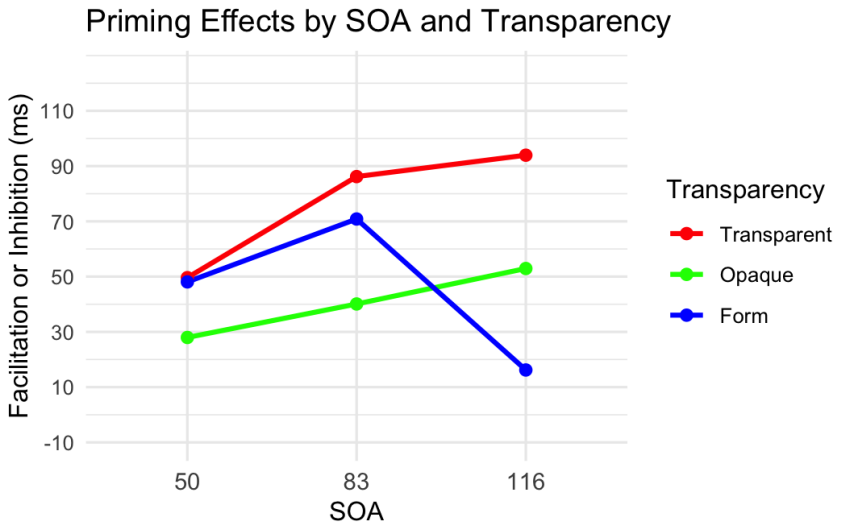
Pattern:

- A significant interaction between semantic transparency (Transparent vs. Opaque) and priming was found at SOA of 83ms, F (1, 11) = 6.66, p = .026.

- Given a sample of 35 subjects, significant semantic transparency effects (f = 0.38) can be found across all SOAs.

Pilot results: incremental unmasked primed lexical decision task

A pilot study of 24 Mandarin-English bilinguals (12M, 12F, Mean age=25.33)



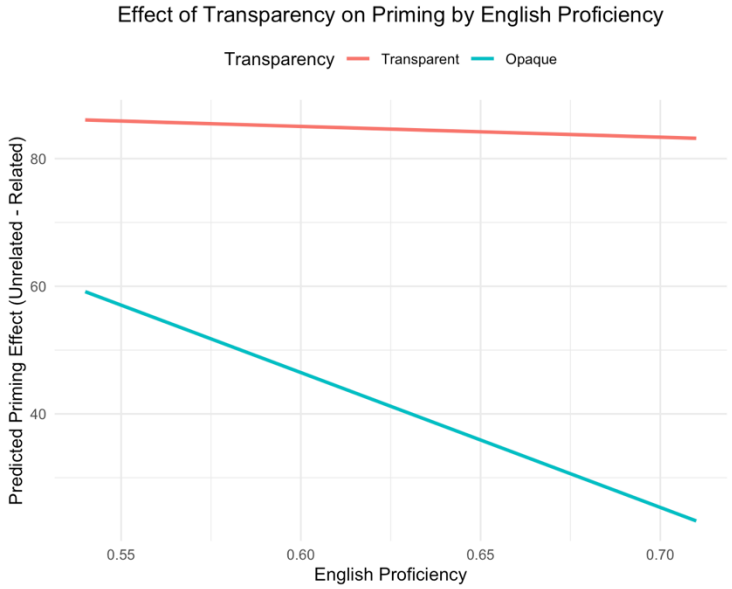
Pattern:

- A significant interaction between semantic transparency (Transparent vs. Opaque) and priming was found at SOA of 116 ms, F (1, 23) = 5.22, p = .021.

- A sample of 46 subjects allows to observe a significant semantic transparency effect (f = 0.31) at SOA of 83ms.

Pilot results: incremental unmasked primed lexical decision task

A pilot study of 24 Mandarin-English bilinguals (12M, 12F, Mean age=25.33)



Pattern:

- L2 learners with better L2 proficiency demonstrated a larger semantic transparency effect.
- Greater morphological activation?

Next step

- Analyze whether morphological awareness would modulate semantic transparency effect in L2 learners.

- Analyze how SOA modulates the effect of L2 proficiency on semantic transparency effect.

- Add a semantic-related condition to tease apart semantic relatedness from morphological activation.

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