HOW DO WE DECOMPOSE FOREIGN WORDS?

Comparing masked priming effects in visual word recognition in a native and non-native language

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BACKGROUND

- Past research suggests that morphological complex words (e.g., darkness, hunter) undergo a rapid morphological segmentation early on during visual word recognition. Importantly, this occurs irrespectively of the semantic relationship between the constituent morphemes of these words (e.g. Rastle et al., 2004).

- Evidence for this stems primarily from masked priming studies, paired with a lexical decision task. These studies have repeatedly shown that the recognition of a target word is facilitated by the prior presentation of a semantically transparent (e.g., dealer - DEAL) or a semantically opaque (e.g., corner - CORN) prime, but not by a non-morphological orthographic prime (e.g., public - PUB).

- However, while morphological segmentation has been widely documented during visual word recognition in a native language (L1), it remains unclear whether the same effect occur during non-native language processing (e.g., see Heyer & Clahsen, 2015 & Diependaele et al., 2011, for contradictory findings), and whether these are modulated by the reader's level of proficiency in their non-native language.

AIMS

- To examine differences in the morphological processing of words in native (L1) and non-native (L2) language.
- To examine whether and how morphological processing in non-native language is influenced by L2 proficiency.
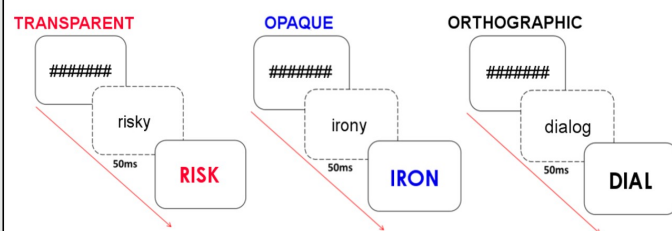
METHODOLOGY

PARTICIPANTS

- 40 native speakers of Italian (13 males, age range 18-29) with English as their second language.
- L2 proficiency was assessed via a battery of tests (phonetic discrimination, spelling, vocabulary, morphological awareness, oral, and reading comprehension).
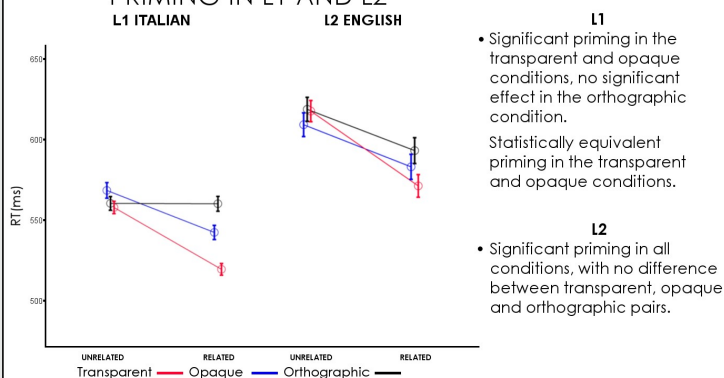
DESIGN

- Target stimuli: 50 prime-target pairs in each of three conditions, transparent, opaque, and orthographic (see Figure below), in each of the two languages tested (Italian as L1, and English as L2).
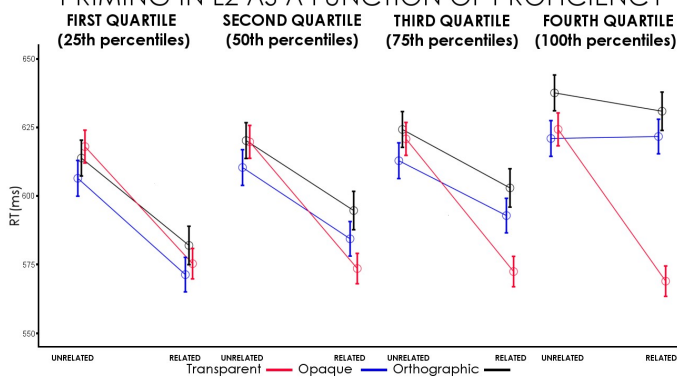- Paradigm: masked priming with a lexical decision.

TRANSPARENT — ###### — risky — 50ms — RISK

OPAQUE — ###### — irony — 50ms — IRON

ORTHOGRAPHIC — ###### — dialog — 50ms — DIAL

RESULTS

PRIMING IN L1 AND L2

L1 ITALIAN   L2 ENGLISH

Transparent — Opaque — Orthographic

L1
- Significant priming in the transparent and opaque conditions, no significant effect in the orthographic condition.

  Statistically equivalent priming in the transparent and opaque conditions.

L2
- Significant priming in all conditions, with no difference between transparent, opaque and orthographic pairs.

PRIMING IN L2 AS A FUNCTION OF PROFICIENCY

FIRST QUARTILE (25th percentiles)   SECOND QUARTILE (50th percentiles)   THIRD QUARTILE (75th percentiles)   FOURTH QUARTILE (100th percentiles)

Transparent — Opaque — Orthographic

- Decrease in opaque and orthographic priming as proficiency increases, and particularly when this latter becomes high. Transparent priming remains constant instead.

ORTHOGRAPHY-SEMANTICS CONSISTENCY

- With higher proficiency L2 readears, RTs to transparent items are quicker overall (i.e., independently of prime relatedness) than to opaque and orthographic items. This is the same pattern found in the L1 literature by Marelli et al. (2015), and explained through **Orthography-Semantics Consistency** (**OSC**).

- OSC is the mean semantic similarity between all members of a same orthographic family (e.g., corn, corner, cornet, cornell, cornwall, corns, cornish). Essentially, it tracks how easily we can guess the meaning of a word, based on the presence of a possible stem (or, in principle, of any other orthographic cue). Formally:

$$OSC(t) = \frac{\sum_{x=1}^{k} f_{r_x} \cos(\vec{t}, \vec{r_x})}{\sum_{x=1}^{k} f_{r_x}}$$

- Where t is the target word, r_x each of its k orthographic relatives, and f_x the corresponding frequencies extracted from English corpora. The OSC measure is a 0-to-1 where values close to 0 identify words that are bad orthographic cues for their associated meanings, and values close to 1 indicate an almost perfect association between form and meaning.

- Based on this definition, one would predict the effect of OSC to grow with proficiency, which is indeed what we observe (see Figure on the right).

RTs IN L2 AS A FUNCTION OF PROFICIENCY AND OSC
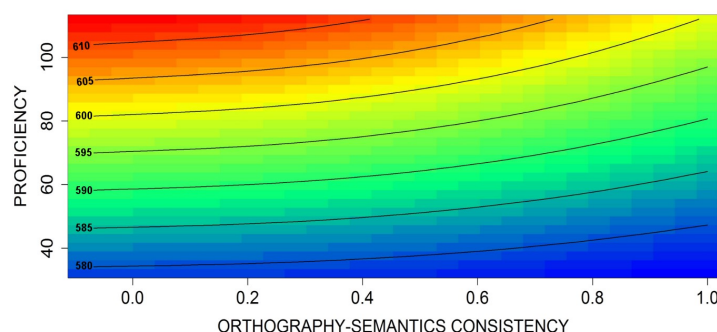
Reaction Times (RTs) - color coded from blue, shorter, to red, faster - as a function of OSC and proficiency. The effect of OSC (i.e., the horizontal color gradient) is larger at high proficiency.

CONCLUSIONS

- Results suggest markedly different priming between L1 and L2.

- Morphological priming in L2 is decisively qualified by proficiency. Low proficiency readers do not make any use of morphology -- their priming pattern is entirely driven by orthographic overlap.

- Readers with higher proficiency capture morphology, but still with one fundamental difference from native speakers, as complex primes are only effective if they are semantically transparent.

- At higher level of proficiency word processing is influenced by the implicit learning of association between form and meaning.

References

Diependaele et al. (2011). *Journal of Memory and Language*, 64, 344-358; Heyer and Clahsen (2015). *Bilingualism: Language and Cognition*, 18, 543-550; Rastle et al. (2004). *Psychonomic Bulletin & Review*, 11, 1090-1098; Marelli, et al. (2015). *The Quarterly Journal of Experimental Psychology*, 68(8), 1571-1583.