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Sublexical vs. Supralexical models of morphological processing:
Towards a reconciliation

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1.   Introduction

Lexical morphemes such as roots, stems, inflectional and derivational affixes constitute the basic ingredients of words in languages. After 30 years of investigations, the majority of the psycholinguists nowadays agree in assigning a central role to morphology within the mental lexicon. More precisely, numerous studies have demonstrated the relevance of morphemes during reading and the earliness of morphological processing during lexical access, suggesting that morphemes are independently coded somewhere in the mental lexicon:
-Either morphemic units stand as access units to word representations (Sublexical approach of Taft, 1994)
-or they organize word representations in terms of morphological families (Supralexical approach of Giraudo & Grainger, 2000).

2.   Sublexical approach: Basics

•Morphemic units correspond to concrete pieces of words (i.e., roots, stems, affixes)
•Complex words are processed according to a decomposition mechanism that stripes off the affix in order to isolate the root or the stem. The morphemic nature of the remaining letter patterns or affix(es) is then checked out by the system in order to eliminate any procedural error.
•Access to word representations (i.e., word forms coded in the orthographic lexicon) can then operate via the pre-activation of the constituent morphemes. This mechanism would explain why two morphological related words prime each other.
•Morphological priming effects only vary according to the ease with which constituent morphemes can be identified/extracted. In other words, the morphological decomposability of the surface form predominates.
•Numerous masked priming studies demonstrated that morphological priming effects are ONLY sensitive to the surface (morphological) form of the stimuli (words and non words), morphological decomposition is a process that is applied to ALL morphologically structured stimuli, irrespective of their lexical, semantic, or syntactic characteristics (see Rastle & Davis, 2008 for a complete review of the literature on morphological priming effects)

3.   Supralexical approach : Basics

•Morphemic units are stored at the interface of word and semantic representations and contribute to organize the lexicon in morphological families.

•The recognition of a complex word triggers the activation of ALL the word forms that can match with it. A competition is then engaged between the pre-activated forms until the right lexical entry reaches its recognition threshold. Competitors send then excitation to their respective base morpheme that in turn, sends back positive activation to them.

•Two morphologically related words prime each other thanks to this mechanism of co-activation. Morphologically complex words are then not "decomposed" properly but can trigger the activation of their constituent morphemes (mainly their base).

•ABSTRACT morphemic units (bases) do not need to exist in the real world in order to be coded in long-term memory but their existence/emergence depends on the interactions between the word and the semantic levels.

•Morphological coding is semantically dependent: morphologically related but semantically unrelated words cannot be related to their base morpheme.

•The manipulation of pure lexical factors like surface frequency, orthographic neighborhood size and family size modifies morphological priming effects (see Voga & Giraudo, 2009).

4.   Towards a reconciliation?

While experimental data strongly support the robustness of morphological surface effects across languages, stimuli and sensorial modality (see Järvikivi et al., 2009), the very recent study conducted by Crepaldi and coll. (under revision in Journal of Memory and Language) opened a new breach in this domain of research.

A series of masked priming experiments was carried out on English irregular inflected forms (viz. allomorphs). Interestingly and contrary to their starting hypothesis, the authors found that allomorphs (e.g., fell), that cannot be decomposed at their surface, primed their verbal base (e.g., fall) more than orthographically-matched (e.g., fill) and unrelated control words (e.g., hope). The authors concluded then the "existence of a second higher-level source of masked morphological priming" and they proposed a lemma-level composed of inflected words acting "at an interface between the orthographic lexicon and the semantic system".

This result relaxes the radical notion of an early morphological decomposition of all complex forms. Moreover, these data support an alternative interpretation of morphological priming effects in which sublexical AND supralexical units of representation are envisaged by the authors. According to them, "the priming observed for irregular inflections arises at a lemma level, which acts as an interface between the orthographic lexicon and the semantic level" (p. 23). We consider that this exception should extend to derived allomorphs (e.g., Fr. scolaire 'scholastic' vs. école 'school') for which morphological segmentation is also problematic. This new approach nicely reconciles the two antagonist hypotheses formulated in the field of morphological processing.

5. The AI model of morphological processing

The new approach of morphological coding integrates two distinct levels of morphological representation, one dedicated to the morphological surface of words and that intervenes during the very early stages of word recognition and the other one, that constitutes the heart of the lexicon in the sense that it organizes it in morphological families and paradigms. Each time a complex word is presented to the cognitive system, the two morphological levels are activated in parallel: the stimulus is both analyzed in terms of its morphological surface structure, while activation spreads through orthographically similar forms that compete with each other. The activated forms excite together their base that sends them back positive activation in order to reduce the lexical competition. Consequently complex word recognition results from two springs of excitation: one coming directly from the saliency of their morphemic structure and the other one, derived from the activation of their morphological family whose heart is the base morpheme.

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