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Effects of reading proficiency on embedded stem priming in primary school children

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ABSTRACT

Prior evidence from masked morphological priming has revealed conflicting findings regarding the acquisition of morpho-orthographic segmentation mechanisms in developing readers. Here, we examined changes in masked morphological priming across grade within a large sample of French primary school children ($n = 191$, Grades 2–5) and how these effects are modulated by individual differences in reading proficiency, spelling proficiency, and morphological awareness. Target words were preceded by either (a) a suffixed word prime (e.g., *tristesse–TRISTE*), (b) a suffixed nonword prime (e.g., *tristerie–TRISTE*), (c) a non-suffixed nonword prime (e.g., *tristald–TRISTE*), or (d) an unrelated prime (e.g., *direction–TRISTE*) using very short prime durations (50 ms). Moreover, a frequency manipulation was included for suffixes and non-suffixes. The results revealed robust suffixed word priming across all children independent of grade and proficiency. On the other hand, priming in the suffixed and non-suffixed nonword conditions was modulated by reading proficiency, with high-proficiency children showing facilitation and low-proficiency children showing inhibition. The effects of suffix and non-suffix frequency were modulated by grade, with decreasing effects as grade increased. None of the observed priming effects were modulated by grade, spelling proficiency, or morphological awareness. The results suggest that reading proficiency is an important predictor for embedded stem

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activation mechanisms in primary school children, which we discuss in the context of recent theories of morphological processing.

Introduction

Over the past decades, much research has been dedicated to understanding how morphemes are processed in the skilled reading system. Most of this research has used the masked primed lexical decision task in combination with behavioral and sometimes electrophysiological measures. This research has generated important insights into the mechanisms and time course of morphological processing in adults (e.g., Beyersmann, Iakimova, Ziegler, & Colé, 2014; Diependaele, Sandra, & Grainger, 2009; Morris, Frank, Grainger, & Holcomb, 2007; for a review, see Rastle & Davis, 2008). However, only recently have scientists begun to explore the development of such processes in children (e.g., Beyersmann, Castles, & Coltheart, 2012; Casalis, Dusautoir, Colé, & Ducrot, 2009; Quémart, Casalis, & Colé, 2011). We first outline the key milestones from morphological processing research in adults, followed by a summary of the related evidence from reading development.

Morphemes are the smallest meaningful entities of which words are composed. Based on a growing body of psycholinguistic evidence in adults, it is now known that the activation of morphemes is a rapid, highly automatized process that does not necessarily require the involvement of semantics. This now broadly accepted view primarily originates from the results reported in numerous masked morphological priming studies, across different languages, showing that not only words with a true morphological structure (e.g., *farm-er*) but also words with a pseudo-morphological structure (e.g., *corn-er*) produce priming of the stem target (e.g., *farm, corn*) even if presented with very short (40–50 ms) prime durations (for a review, see Rastle & Davis, 2008). Because the meaning of a pseudo-affixed word like *corner* cannot be derived from the meaning of its constituents *corn* and *er*, it has been argued that the activation of the embedded stem *corn* must be due to a semantically blind "morpho-orthographic" decomposition process.

In addition to the evidence for morpho-orthographic processing, masked morphological priming studies in adults have further revealed that truly suffixed words tend to produce slightly stronger stem–target priming (e.g., *farmer–FARM*) than pseudo-suffixed words (e.g., *corner–CORN*), particularly when the prime is partially or fully visible (e.g., Diependaele et al., 2009; Feldman, O'Connor, & Moscoso del Prado Martin, 2009). These findings suggest that the early morpho-orthographic processing stages are followed by a later "morpho-semantic" processing stage by which truly affixed words (but not pseudo-affixed words) are segmented into semantically defined morphemic units.

Critically, the data discussed above have recently been complemented by masked priming studies using morphologically structured nonword primes. Longtin and Meunier (2005) were the first to report priming with suffixed nonwords (e.g., *rapidifier–RAPIDE*) but not with non-suffixed nonwords (e.g., *rapiduit–RAPIDE*). However, recent morphological priming studies have found results that partially deviate from the Longtin and Meunier pattern (Beyersmann, Casalis, Ziegler, & Grainger, 2014; Morris, Porter, Grainger, & Holcomb, 2011). Beyersmann, Casalis, and colleagues (2014) examined lexical decision times to target words preceded by one of four different types of primes: (a) a suffixed word prime (e.g., *tristesse–TRISTE*), (b) a suffixed nonword prime (e.g., *tristerie–TRISTE*), (c) a non-suffixed nonword prime (e.g., *tristald–TRISTE*), or (d) an unrelated prime (e.g., *direction–TRISTE*). The results revealed robust and equal priming in the two suffixed conditions across all participants, suggesting that not only suffixed real words but also suffixed nonwords are rapidly decomposed into morpho-orthographic subunits at early stages during visual word recognition. Thus, this demonstrates that morpho-orthographic decomposition mechanisms apply even in a nonword context where the semantic stem–affix relationship is entirely non-interpretable.