Meaningless morpho-orthographic parsing: Evidence from word-picture relatedness tasks

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Background: How do we recognize complex and seemingly complex words? Research into the nature of the visual word recognition system has shown that morphology plays a special role in mediating the mapping between orthographic input and semantic access—with the recognition of complex words (*skier*) involving the detection of their constituent morphemes. However, it is still unclear how the system treats morphologically simplex words containing letter segments that resemble potential morphemes (*moth-er*, *can-oe*) [1, 2]. If they are treated as potential morphemes, this signals a parser that is initially blind to semantics, although informed about potential morphemes in the language. Considering that morphemes are also individuated by their semantics—i.e., by their linguistic properties and the concepts they map onto—a semantically insensitive parser should allow for the semantic access of orthographic sequences even when these are not true morphemes. In the present study, we investigated this issue by tapping at the semantic representations that are triggered by the outputs of the visual word recognition system and the object recognition system.

Method: In two experiments employing a word-picture relatedness task, we investigated whether a potential root is detected by measuring the degree of semantic access of the morpho-orthographic sequence when embedded to the left or right edges of affixed (*skier*, *unmask*), pseudo-affixed (*mother*, *sublime*) and non-affixed words (*canoe*, *grapple*). Stimuli were presented sequentially, with pictures appearing for 200 ms either before (Exp. 1) or after (Exp. 2) words (56 ms exposure).The key manipulation involved presenting the full word (*skier*) and a picture referent of the potential root (*SKI*), with participants instructed to judge the relation between the stimuli pair. Word relation was also manipulated, such that experimental pictures (*SKI*) were paired with either full words (*skier*), roots (*ski*), or unrelated controls (*rower*). The root condition established ceiling semantic access to the root representation, whereas the unrelated control condition measured baseline error rates to target pictures—that is, responding “related” to the picture *SKI* and the word *rower.*

Results: To measure the degree to which “roots” were semantically accessed, analyses were conducted on the proportion of “yes” relatedness judgements between picture-word pairs. Results across Experiments 1 (n =72) and 2 (n=56) were largely consistent, whereby roots yielded more positive relatedness judgements than affixed, pseudo-affixed and non-affixed words (see Figure 1). The advantage of the root alone (e.g., *moth*), however, was greater for pseudo-affixed (e.g., *mother*) and non-affixed words as compared to affixed words. Finally, the word relation by root position interaction revealed that full words with left-embedded roots (e.g., *skier*) elicited more positive responses than those with right-embedded roots (e.g., unmask; see Figure 2).

Discussion: The main findings of the present study suggest that “roots” embedded in pseudo-affixed and non-affixed words are semantically accessed, independent of position or the presence of true affixes. We can draw three main conclusions from these results. First, the visual word recognition system seems initially blind to semantics, consistent with other models [3–5]. Second, the parser seems to detect all “roots” even when the remaining letter segments do not form a potential affix (*can-oe*). These findings of parsing in the absence of morphological structure are consistent with evidence from (i) visual masked priming with nonword primes (*lovedel-LOVE*) [6] and (ii) the semantic categorization task [7]. And, third, the left-embedded root advantage (e.g., *skier*) over right-embedded roots (e.g., *unmask*) suggests that the parser employs a left-to-right scan of letter strings, whereby the leftmost “constituent” is detected first [8]. Taken together, our results support the view of a “meaningless” or semantically-blind word recognition stage that detects and accesses all morpho-orthographic constituents through a left-to-right scan of the graphemic input. Following the semantic access to constituents and full words, representations that are inconsistent with the full word analysis performed by the parser are quickly suppressed, consistent with a modular model of word recognition [5].

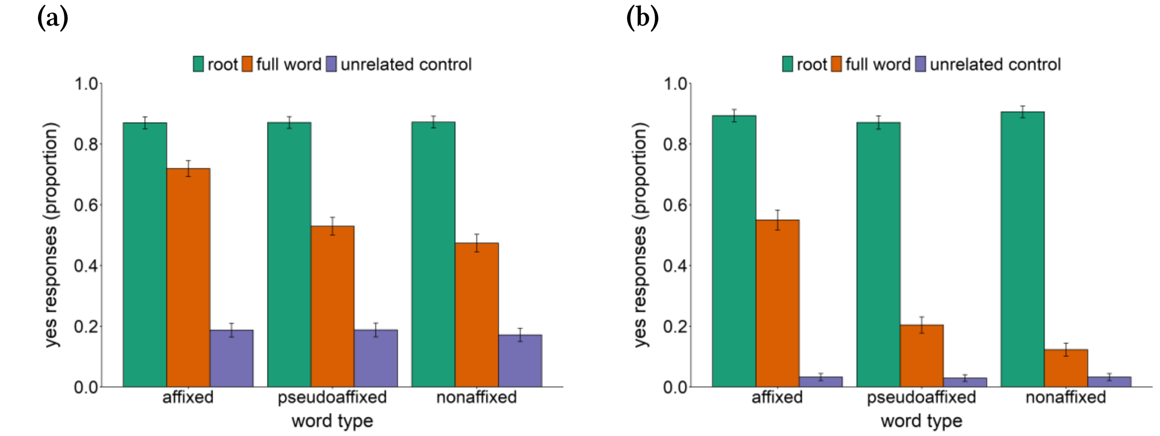

Figure 1: Positive relatedness judgements in Experiments 1 (panel A) and 2 (panel B) as a function of word type (e.g., *skier*, *mother*, and *canoe*, respectively) and word relation (e.g., *ski*, *skier*, and *rower*, respectively). Error bars represent 95% CIs of group means.

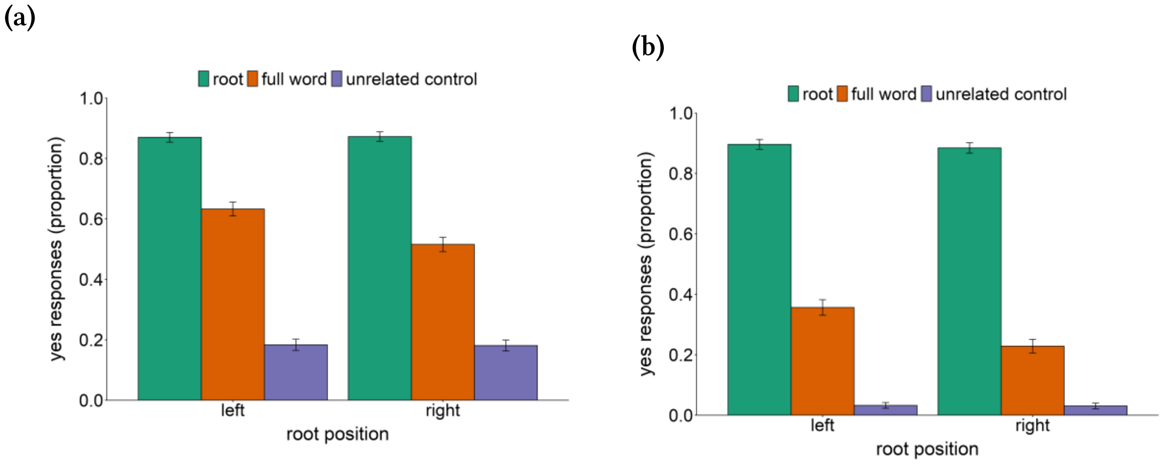

Figure 2: Positive relatedness judgements in Experiments 1 (panel A) and 2 (panel B) as a function of root position (e.g., *skier* and *unmask*) and word relation (e.g., *mask*, *unmask*, and *unroll*, respectively). Error bars represent 95% CIs of group means.

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