Investigating the time-course of semantic access during morphological processing:

An eye-tracking study using the gaze contingent paradigm

The purpose of the present work is to address a long-standing debate between two conflicting psycholinguistic accounts of semantic access during the processing of morphologically complex words. Under the late-lexical-access account, the processing of morphologically complex words unfolds in a strictly serial fashion (Rastle, Davis & New, 2004). This view posits that semantic information cannot be unlocked until the orthography of the whole complex word has been processed. In contrast, the early-lexical-access account proposes that semantic information is activated as soon as orthographic processing begins (Feldman, O'Connor & Moscoso del Prado Martín, 2009). Under this hypothesis, parallel activation of orthographic and semantic information guides the identification of the whole complex word.

Noun-noun compounds provide a unique test case for this time-course issue because they are morphologically complex and vary in their degree of semantic transparency. Semantic transparency is a measure of the strength of the semantic association between the meanings of each constituent morpheme within a compound to the meaning of the whole compound. For example, there is an opaque relationship between *hog* and *wash* to *hogwash* and a transparent relationship between *car* and *wash* to *carwash*.

Eye-tracking studies offer a fine resolution of the time-course of word identification, and evidence from this methodology appears to support the early-lexical-access view of morphological processing. In a recent study, Kuperman and Baayen (in preparation) found that the availability of semantic transparency between the left constituent of a compound and the whole word facilitated recognition of the compound. For example, the meaning of *stop* transparently contributes to the whole-word meaning of *stopwatch*, and this semantic relation facilitates access to the compound by way of interactive semantic activation. However, a strong semantic association between the left and right constituent of the compound slowed down reading times of the whole-word. For example, the strong semantic association between *rain* and *storm* slowed down recognition of *rainstorm* because of the increased lexical competition between the compound's head (*storm*) and the compound itself (*rainstorm*). In operational terms, these findings were taken as support for the early-lexical-access account of morphological processing.

In this talk, I will present preliminary data from a novel eye-tracking experiment, which uses the gaze-contingent paradigm in order to further address the early-versus-late accounts of semantic access. In the reported experiment, 110 unspaced compounds with varying semantic transparency, measured using a computational Latent Semantic Analysis technique (Landauer & Dumais, 1998), were embedded within a list of context-neutral sentences. Participants were asked to simply read the sentences and eye-movement behaviour was recorded. Crucial to the study, the gaze-contingent boundary method was deployed with the aim of detecting a record of early semantic access. In a gaze-contingent trial, effects of parafoveal orthographic processing of the right constituent of the compound are eliminated. The orthography of the right constituent of the critical compound word is garbled until eye-gaze progresses past the left constituent (e.g. *carmxuk* turns to *carwash* after the eye moves past *car*).

Our rationale is that an observed effect of a semantic transparency relationship on early eye-movement measures implies that semantic access precedes complete orthographic processing. Our findings will ultimately contribute to adjudicating between two competing theories of morphological processing, which argue for either an early or late role of semantics during the time-course of word processing.

References

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