

# Decomposition of compound words: an MEG measure of early access to constituents

Robert Fiorentino (cnlrob@wam.umd.edu)

David Poeppel (dpoeppel@deans.umd.edu)

Department of Linguistics, University of Maryland  
1401 Marie Mount Hall, College Park, MD 20782

## Introduction

The psychological reality of the morphological complexity difference between compounds (*teacup*) and single words (*crescent*) is highly controversial, and the conditions and time course of morphological decomposition remain contested in the psycholinguistic literature (McQueen & Cutler, 1998). Decomposition is argued to occur early or late (Andrews, 1986), in novel but not lexicalized compounds (Van Jaarsveld & Rattink, 1988), and in long but not short compounds (Bertram & Hyönä, 2003). This study investigates decomposition in compounds using magnetoencephalography (MEG) in a visual lexical decision paradigm comparing compounds (CW) and single words (SW). The results suggest early decomposition, regardless of lexicalization or constituent length.

Response time (RT) is sensitive to both early and late processes, whereas the latency of the MEG component at 300-400ms after word onset (M350) indexes early lexical activation but not post-lexical processing (Embick et al. 2001, Pykkänen et al. 2002). When the first and second CW constituents have higher log frequency (1.96/1.96 vs. 0.455) and shorter letter-length (3.82/4.0 vs. 7.8) than the SW, early decomposition predicts faster RT and earlier M350 than SW, reflecting constituent over whole-word properties. Late decomposition predicts faster RT but not earlier M350. Since the CW are lexicalized and have short constituents, lexicalization and length constraints predict no RT or M350 differences. Whole-word-only accounts likewise predict no RT or M350 differences.

## Experimental Design and Results

Monolingual English speakers responded to 60 disyllabic noun-noun CW, 60 pairwise-matched SW, both drawn from the Cobuild English corpus, and 120 NW including 12 word-nonword (*boxshep*) foils.

A 160-channel whole-head MEG system (Kanazawa Institute of Technology, Japan) recorded brain activity (1000Hz sampling rate), that was noise-reduced, averaged by condition, baseline corrected (100ms prestimulus interval), and band-pass filtered (1-30Hz). Peak latency was analyzed from the root mean square of 10 channels from the canonical M350 source distribution.

RT is faster and M350 earlier in CW, except in the lowest frequency items, in which RT but not M350 is delayed (predicted for novel CW under early decomposition and seen also in foils). M350 tracks frequency only for SW.

Table 1: Mean RT and Peak Latency of M350

Condition	RT(ms)/Acc.	M350 (ms)
CW/SW	682/740 (97/91%)	341/372
High Freq. CW/SW	635/663 (100/100%)	344/364
Low Freq. CW/SW	761/755 (93/81%)	340/387

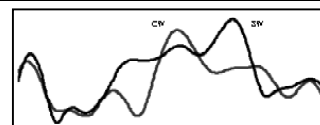


Figure 1: M350 waveforms for CW and SW (150 to 450ms)

## Conclusion

These results taken separately support previous RT results (e.g. Andrews, 1986) and M350 findings (Embick et al., 2001; Pykkänen et al., 2002). Taken together, they argue for early access to noun-noun compound constituents regardless of lexicalization or length constraints.

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