Rapid lexical processing revealed by the time-course of ERP responses

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Introduction

Major debate in language processing concerns whether information is processed sequentially (Trueswell et al., 1995)
Sequential processing predicts late effects for higher-level information; parallel processing predicts simultaneous effects
Questions:
What is the time-course of lexical, semantic, and syntactic processing?
Is information processed in parallel across different levels of organization?
Recent work suggests lexical processing begins by 140-200 ms (Baart & Samuel, 2015; Toscano et al., in prep)
Certain ERP components may reflect these processes (N400; P600), but there is debate over what these components index (Kutas & Federmeier, 2011; Tanner & Van H Ell, 2014)
Alternative approach is to use component-independent design to examine time-course (Thorpe et al., 1996)

Method

Word-initial voicing minimal pair stimuli presented over Etymotic ER-3A insert earphones at MCL
Cross-spliced to control for acoustic differences
Each stimulus presented 40 times in Exp. 2 and 20 times in Exp. 3-4, in random order

N=15 subjects; no N1 differences (i.e., cross-splicing was successful)
Lexicality effect observed at several scalp locations, particularly at central-parietal channels (Cz, Pz, CP1, CP2)
Effect onset occurs 62 ms after POD (coarticulatory info for final phoneme; 326 ms)

Experiment 1: Stimulus Norming

Sets of minimal pair stimuli presented to identify pairs that served as clear exemplars of the relevant category

Experiment 2: Lexical Status

Lexicality effect observed at several scalp locations, particularly at central-parietal channels (Cz, Pz, CP1, CP2)

Experiment 3: Syntactic Class

No N1 differences (as expected)
Syntactic class (noun vs. verb) difference observed for Pz 92 ms after POD (288 ms)
Potentially earlier effects but insufficient statistical power

Experiment 4: Semantics (Animacy)

No N1 differences (as expected)
Animacy effect at Cz 46 ms after POD (288 ms)
Earlier effect at Pz (-142 ms before POD); may be due to coarticulatory information in vocoid from /n/-final stimuli

Phonetic Effects

Larger N1 for short VOTs

Cross-splicing Procedure

Onset and coda of each stimulus cross-spliced to control for acoustic differences; e.g., Experiment 2:

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