A funny thing happened on the way to articulation: N400 attenuation despite behavioral interference in picture naming

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Introduction

The presence of words during picture naming tasks produce variable effects on naming times depending on the relationship of the word and the target picture. Words identical to the name of the target picture result in faster naming times relative to unrelated words. Words with overlapping onset segments to target picture names also exhibit a pattern of facilitation. However, semantically related words tend to increase naming times to target pictures relative to unrelated words. This assumed to reflect ‘selection by competition’ at the lexical level [2]. Manipulations of SOA [3] and masking, however, can reverse the semantic interference effect. Caramazza and colleagues suggest that the semantic interference effect is actually due to response selection [1].

We measured event-related potentials (ERPs) during an overt naming task to determine the locus of these effects. Attenuation of the N400 component to related (vs. unrelated) words reflects the ease of lexico-semantic access while differences in naming times to related (vs unrelated) words reflected the result of lexical and post-lexical processing.

ERP Results

ERP waveforms by Relationship Type and Relatedness: Time locked to onset of target pictures. Colored lines represent the related level of the relationship type, black lines represent the unrelated level.

350-600 ms

Identity Phonemic Onset Semantic

Voltage Maps by Relationship Type: Average difference between related and unrelated levels between 350 and 600 ms after target picture presentation. Identity and semantic priming both resulted in significant differences relative to unrelated primes across the time window, onset priming did not.

Behavioral Results

Naming Latencies by Relationship Type and Relatedness: The average error rate of naming accuracy for each word prime–target picture relationship is given in the upper right of each column.

Conclusions

Attenuation of the N400 and shorter naming times were both observed to pictures preceded by identity related (vs. unrelated) lexical primes. Shorter naming times without ERP modulation were observed to pictures preceded by onset overlapping (vs. unrelated) lexical primes. An attenuated N400 (electrophysiological priming) and longer naming times (behavioral semantic interference) were observed to pictures preceded by semantically related (vs. unrelated) primes.

These dissociations between ERP modulation and naming times suggest (a) that semantic behavioral interference occurs at a later stage of processing than lexico-semantic activation, and (b) that onset priming also occurs post-lexically, during encoding of the speech response.

Methods

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Prime</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity (Unrelated)</td>
<td>rabbit</td>
<td>(yarn)</td>
</tr>
<tr>
<td>Semantic (Unrelated)</td>
<td>horse</td>
<td>(pear)</td>
</tr>
<tr>
<td>Phonemic Onset (Unrelated)</td>
<td>canoe</td>
<td>(sedan)</td>
</tr>
</tbody>
</table>

ERPs measured with 29 active tin electrodes, continuously sampled at 200 Hz with a bandpass filter of 0.01-40 Hz.

References

[1] Finkbeiner, M., Carramazza, A. Cortex 2006;42(7):1028-31

Acknowledgments

This research was supported by NIMH (R01 MH071635) and NARSAD (with the Sidney Baer Trust) grants to Gina R. Kuperberg.