ERP studies of visual and auditory processing of negated sentences

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2019

Document Version:
Publisher's PDF, also known as Version of record

Link to publication

Citation for published version (APA):
ERP studies of visual and auditory processing of negated sentences

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Introduction

Previous research shows that negation is ignored in initial processing and the event-related potential (ERP) component N400 is insensitive to negation in the presence of semantic priming effects [2-3, 5]. But other evidence has shown that negation can be readily integrated and incongruities in negated sentences can elicit an N400 [6]. Most of this research has focused on negated forms such as not, no or any while little is known about prefixally negated words (e.g. unauthorized, unintentional) despite their high frequency of occurrence in language use [7].

Aim and research questions

- Two ERP experiments in visual and auditory modalities to investigate affirmatives (authorized), prefixal negation (unauthorized) and sentential negation (not authorized) in sentential contexts such as example 1:

1) The White House announced that the new Obama biography was authorized/unauthorized/not authorized and the details in the book were correct/wrong in actual fact.

- ERPs time-locked to the critical word (underlined), the congruency of which was determined by the adjective (bold) in the first part of the sentence. We asked the following questions:

  Visual study:
  - Is there a delay in the integration of negated meanings?
  - Is prefixal negation processed similar to the negated form or the affirmative form?

  Auditory study:
  - Is auditory presentation of sentences more natural and easier than visual processing?

Visual:

Affirmative

<table>
<thead>
<tr>
<th>Sentence</th>
<th>The White House announced that the new Obama biography was</th>
<th>The White House announced that the new Obama biography was</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sentential negation</td>
<td>not authorized and the details in the book were correct/wrong in actual fact</td>
<td>not authorized and the details in the book were correct/wrong in actual fact</td>
</tr>
<tr>
<td>Prepositional negation</td>
<td>correct/wrong</td>
<td>correct/wrong</td>
</tr>
</tbody>
</table>

Note: In the two figures above, the shaded areas indicate all the time windows where a significant difference between the incongruent and congruent conditions in each sentence type was found. For presentation purposes, only parts of the (significant) results are reported where the estimated difference (β) the standard error within parentheses and the t-value (significant ≥ 2) are reported.

Method

Material

- 3 pseudo-randomized lists each including 108 (visual) and 102 (auditory) items

Visual

- Participants: 26 English native speakers (18 F, mean age =29.9)

Presentation

- Counter-balanced, 9 and 11 ms before the adjective and critical words

Auditory

- Displayed on a computer screen for 1,000 ms

Procedure

- ERP in auditory studies later than those in visual study, unlike previous research

- Pre-N400 negativity in auditory study (affirmatives), an N250 [1,4]?