About embarking dogs and gracious mice: An ERP study on the integration of embedded words

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Background

In spoken language many words contain shorter words, for example the word *gracious* contains the word *grey*. We know from word-recognition research that lexical and semantic representations of word-initial embedded words, e.g., the Dutch word *snor* (moustache) in *snorkel* (snorkel) are temporarily activated as the acoustic information unfolds. The evidence regarding the activation of word-final embeddings, e.g., the Dutch word *meel* (flour) in *kameel* (camel) is less conclusive. There are, however, no studies that used ERPs to examine whether word-initial and word-final embeddings participate in the sentence-level semantic integration process.

Question

Do listeners briefly try to integrate the meaning of (initial and final) embedded words into the preceding context?

FINAL EMBEDDINGS

BAD FIT	Jane wilde een jurk kopen, maar zag dat er geen **kameel** in de dierentuin was *Lit. Jane wanted to buy a dress, but saw that there no camel[flour] in the zoo was*
GOOD FIT	Jane wilde een taart bakken, maar zag dat er geen **kameel** in de dierentuin was *Lit. Jane wanted to bake a cake, but saw that there no camel[flour] in the zoo was*
CONTROL	Amy kreeg een beetje honger en hoopte dat er nog een **banaan** in haar tas zat *Lit. Amy got a bit hungry, and hoped that there still a banana in her bag was*

INITIAL EMBEDDINGS

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BAD FIT	De man vroeg de zangeres of ze zijn **snorkel** op zolder had zien liggen *Lit. The man asked the singer whether she his [moustache]snorkel in the attic had seen*
GOOD FIT	De man vroeg de kapster of ze zijn **snorkel** op zolder had zien liggen *Lit. The man asked the hairdresser whether she his [moustache]snorkel in the attic had seen*
CONTROL	De hoogleraar vroeg zijn vrouw of ze zijn **toga** in de kast had zien hangen *Lit. The professor asked his wife whether she his gown in the closet had seen*

Rationale

If listeners try to integrate the meaning of embedded words into the sentence, the N400 component elicited by the anomalous carrier words should be modulated by the goodness of fit of the embedded words. If listeners do not attempt to integrate the meaning of the embedded words, there should be no difference between the *bad fit* and *good fit* condition as the semantic fit of the carrier words is comparable in these conditions.

Methods

We recorded the EEG from 28 Dutch participants while they listened to a mix of 432 sentences of which 79 sentences contained a carrier word with an initial embedding and 65 sentences contained a carrier word with a final embedding. No additional task was imposed. Each subject heard each carrier word in only one of the two test conditions (*bad fit* or *good fit*).

Final Embeddings
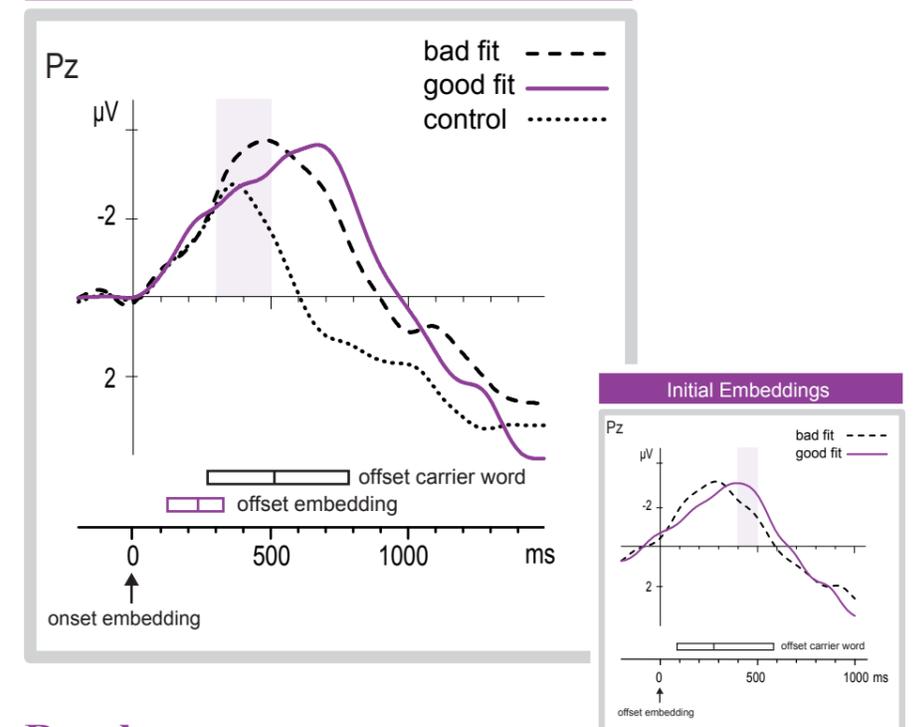
Initial Embeddings
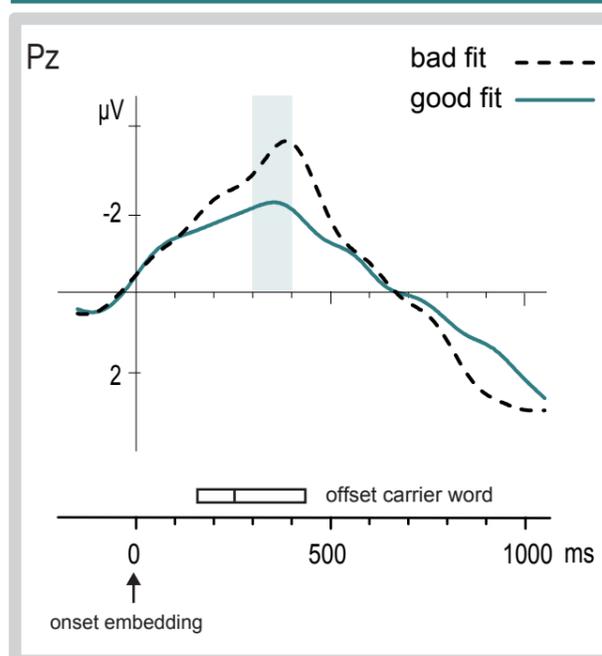
Results

Both initial and final embeddings showed a significant difference between the *bad fit* and *good fit* condition. Carrier words elicited a smaller N400 when the embedded word was coherent in the context than when it was not, demonstrating that listeners briefly try to integrate the meaning of the embeddings into the context. In addition, ERPs time-locked to the offset of the initial embeddings showed an increased N400 in the *good fit* condition, indicating that participants had more difficulty integrating the carrier word into the sentence when it contained an embedding that was coherent in the context.

Conclusion

Listeners try to integrate the meaning of both the intended carrier words and their (initial or final) embeddings into the context. These results demonstrate that semantic integration of lexical candidates is an incremental process.