Events along the garden path: A reduced N400 and a P600 in semantically reversible discourse

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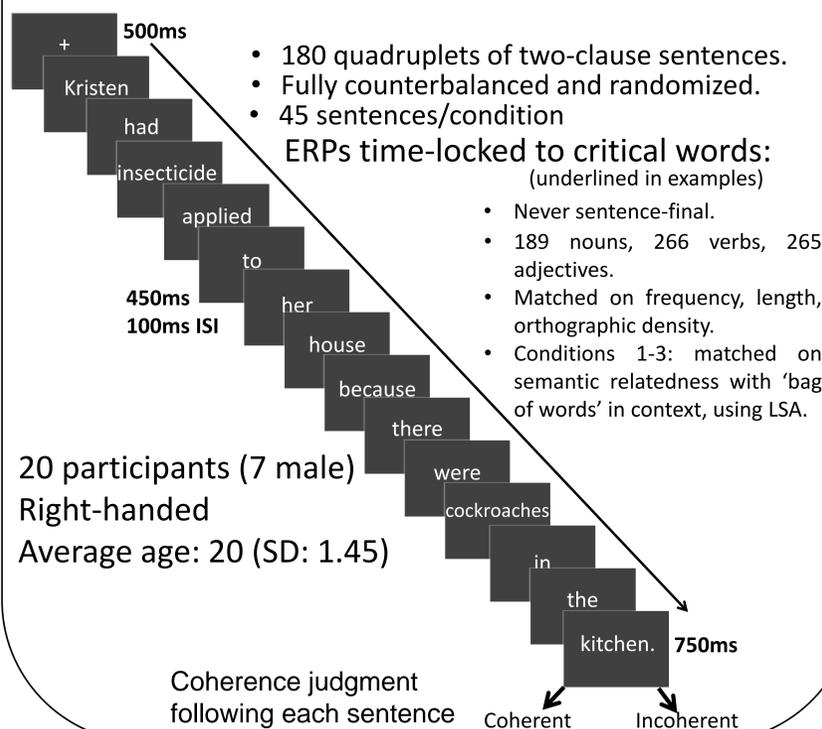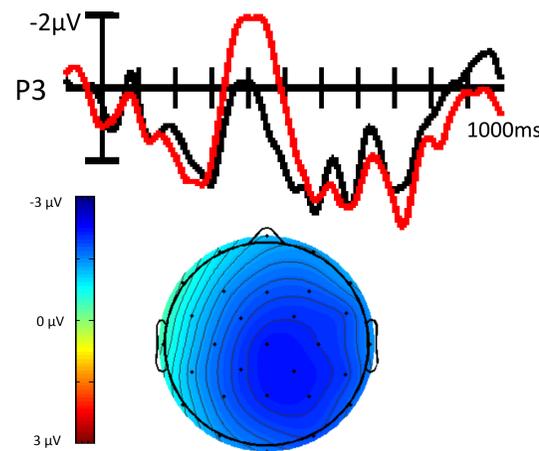
Background

• We store vast amounts of knowledge within memory, including information about familiar events, states and facts (1,2,3), as well as their likely relationships (4,5,6,7).

• How quickly can we draw upon this type of knowledge to predict upcoming events during word-by-word sentence comprehension? And what happens if we predict wrongly?

Design

Condition Name	Description	Example
Event-related Coherent	Second event is causally related to the first.	Kristen had insecticide applied to her house because there were cockroaches in her kitchen.
Event related Incoherent	Reversible discourse. Events are temporally related to one another but the discourse connector, 'because', renders their causal relationship incoherent.	There were cockroaches in Kristen's kitchen because she had insecticide applied to her house.
Lexically related Incoherent	Events are unrelated but the critical word is semantically related to lexical item(s) in the first clause.	Kristen had insecticide applied to her house because it was brick and metal throughout.
Unrelated Incoherent	Events are completely unrelated.	Kristen had insecticide applied to her house because she had a meal with her friends.

500ms
Kristen
had
insecticide
applied
to
her
house
because
there
were
cockroaches
in
the
kitchen. 750ms

450ms
100ms ISI

• 180 quadruplets of two-clause sentences.
• Fully counterbalanced and randomized.
• 45 sentences/condition
ERPs time-locked to critical words:
(underlined in examples)
• Never sentence-final.
• 189 nouns, 266 verbs, 265 adjectives.
• Matched on frequency, length, orthographic density.
• Conditions 1-3: matched on semantic relatedness with 'bag of words' in context, using LSA.

20 participants (7 male)
Right-handed
Average age: 20 (SD: 1.45)

Coherence judgment following each sentence
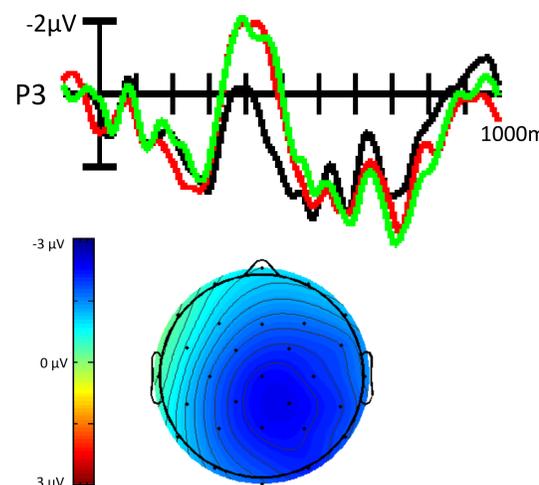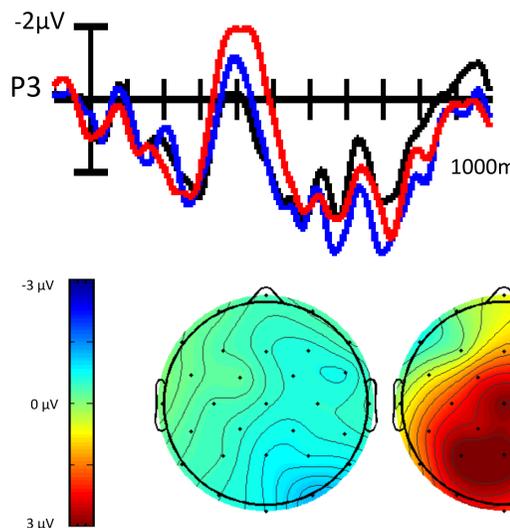Coherent   Incoherent

Results

N400: larger to critical words in *Unrelated Incoherent* than *Event related Coherent* sentences

Unrelated Incoherent minus **Event related Coherent: 300-500ms**

N400 also larger to critical words in *Lexically related Incoherent* than *Event related Coherent* sentences, despite being matched on LSA.

Lexically related Incoherent minus **Event related Coherent: 300-500ms**

BUT some N400 attenuation to critical words in the *Event related Incoherent* sentences.

These critical words, however, produced a P600 effect.

300-500ms   600-800ms

Event related Incoherent minus **Event related Coherent**

Conclusions

(1) We use stored relationships between events, beyond simple lexical semantic relationships, to predict upcoming events during comprehension, even in non-lexically constraining contexts (see also ref 8).

(2) Event predictions can influence semantic processing of incoming words, ahead of these words being fully integrated into their context.

(3) Event predictions can also influence later stages of processing: if full integration of an incoming word into its context yields an event representation that disconfirms these predictions, and this error is detected, the parser commits to additional analysis or reanalysis of the input (9).

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