The brain dissociates between different levels of prediction during language comprehension
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Introduction
Comprehenders continually generate probabilistic predictions at multiple levels of representation [1]
Here we asked whether and how predictions at different levels influence neural processing of incoming words
We recorded ERPs using a design in which target nouns fulfilled or violated contextual predictions at the level of specific lexical items and/or verb-argument event structure

Design
Lexically constraining contexts (average constraint: 79%)
The lifeguards received a report of sharks right near the beach. Their immediate concern was to prevent any incidents in the sea. Hence, they cautioned the....
(1) SWIMMERS / (2) TraINEES / (3) DRAWER ...
Target nouns were:
(1) Lexically Predictable
(2) Lexical Prediction Violations
(3) Lexical Prediction + Animacy Violations
Lexically non-constraining contexts (average constraint: 26%)
Eric and Grant received the news late in the day. They decided it was better to act sooner than later. Hence, they cautioned the....
(4) TraINEES / (5) DRAWER ...
Target nouns were:
(4) Lexically Unpredictable (non-violating)
(5) Animacy Violations

Method
• 24 right-handed native English speaking volunteers participated
• Participants performed an acceptability judgment task
• Discourse contexts appeared in full; the third sentence appeared word-by-word at 450 ms duration and 100 ms ISI
• ERPs recorded with 32 Biosemi active electrodes, continuously sampled at 512 Hz with a bandpass filter of DC – 104 Hz

Semantic predictability
The amplitude of the N400 [2] was selectively reduced to the Lexically Predictable nouns compared to all other conditions
All non-predictable critical words (conds. 2-5) were matched on semantic relatedness to the contexts using Latent Semantic Analysis
Thus, the N400 primarily reflects the predictability of an incoming word’s semantic features, rather than either its lexical predictability or its message-level coherence

Violations of lexical predictions
A Late Anterior Positivity was selectively enhanced to unpredictable nouns that were Lexical Prediction Violations compared to Lexically Unpredictable (non-violating) nouns [cf. 3]
The Late Anterior Positivity was not elicited by lexically violating nouns if these nouns were also Animacy Violations

Violations of event structure predictions
A Late Posterior Positivity (the P600 effect [4,5]) was selectively enhanced to nouns that violated event structure based on animacy restrictions of the verb [cf. 6,7]
The amplitude of the P600 was larger for Animacy Violations in constraining contexts (violating lexical predictions) compared to Animacy Violations in non-constraining contexts (no violation of lexical predictions)

Conclusions
We observed clear dissociable neural signatures of semantic facilitation, lexical prediction violations, and event structure prediction violations in the same participants performing the same task
Taken together, these findings support a hierarchical generative architecture in which unfolding bottom-up evidence that has not already been predicted at a given level of representation manifests in the brain as distinct spatiotemporal neural signatures

References & Acknowledgements

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