Brouwer, H., Fitz, H., & Hoeks, J. (2012) Getting real about Semantic Illusions: Rethinking the functional role of the P600 in language comprehension. *Brain Research*, 127-143.

* Semantic Illusion (SIE)- semantically anomalous, syntactically well-formed sentence elicits a P600-effect but no N400
  + Participants temporarily think the sentence makes sense
  + Participants eventually realize their interpretations were wrong🡪resolve conflict through effortful syntactic processing
* Multi-stream models: separate semantic analyzer puts forward an interpretation of a sentence not in line with its surface structure
  + Proposal to account for semantic illusion
  + Authors don’t think they work
    - All models think the amplitude of the N400 indexes the relative difficulty of integrating the meaning of an incoming word into a partial interpretation of a sentence
    - But actually N400 is probably the retrieval of the meaning of a word from long-term memory
    - And integration is actually P600

Explaining the SIE through Multi-Stream Models

Semantic Attraction

* Animacy-based thematic role violation🡪SIE
* “the hearty meal was devouring…”
* high semantic attraction🡪well-established semantic relationships between the argument and verb🡪no N400
  + “the dusty tabletops were devouring” has no semantic attraction🡪N400
* high semantic attraction🡪syntax must be wrong (semantics override syntax)
* syntax and semantics processed autonomously and can give rise to diff interpretations of a sentence
* but doesn’t always work (doesn’t explain P600 with errors that rely on world knowledge as opposed to animacy violations)

Monitoring theory

* Algorithmic, syntax-driven stream & plausibility (semantic) heuristic stream driven by world knowledge
* Mismatch between streams 🡪reanalysis and P600
* Agree that sentence is plausible🡪no N400 or P600
* Agree that sentence is implausible🡪N400
* If algorithm processor says “implausible” and plausibility heuristic says “plausible”🡪P600 to revise streams
  + SIE
* Doesn’t account for biphasic N400/P600 effects

Continued Combinatory analysis

1. Semantic Memory stream
   1. Similar to plausibility heuristic
2. Syntax-driven stream
   1. Uses morpho-syntactic constrains to build a representation of meaning
3. Thematic-role based
   1. Uses semantic-thematic cues to build an interpretation
   2. 2&3 are combinatory streams

* Interactive streams that can influence each-other
* Resolve conflict between combinatory streams🡪P600
* Semantic memory stream🡪N400
* Semantic processing blocked when there’s a conflict in combinatory streams
* Biphasic N400/P600-effects problematic

The extended Argument Dependency Model (eADM)

* Language processor constructs an interpretation of the sentence before the final verb is reached🡪CCA model should produce effect before final verb sometimes
* Focuses on explaining thematic role assignment
* 2 processing streams:
  1. Assigns thematic roles to incoming NPs based on “prominence” info and links these roles to the argument structure of an incoming verb
     1. Problem🡪N400
  2. Semantic processing (plausibility)
     1. Problem🡪N400
* Conflict in streams🡪P600
* After general mapping step (2 streams) input checked for well-formedness to evaluate acceptability of a structure under different environments
  + Problem🡪P600
* Problems only apparent once they reach the final verb
* Not perfect. Sometimes🡪P600 when N400 is actually found

Processing Competition

* 2 streams

1. Syntactic
2. Semantic

* Both streams simultaneously construct an interpretation of the incoming sentence
* Conflict between 2 streams🡪stream with weakest support must resolve conflict
  + Ex. Weak syntactic stream🡪P600
* Doesn’t account for biphasic N400/P600-effect

Rethinking the functioning role of the N400 and P600

* SIE🡪semantic info processed separately and autonomously🡪multi-stream models
* Instead of abandoning single-stream we should rethink functional interpretation of N400 and P600

N400 as memory retrieval

* Amplitude of N400 reflects mental processes that accompany retrieval of lexical info from long-term memory
* Bottom-up process
* Doesn’t involve integrative semantic processing or semantic competition
* Top-down info (from existing mental represtnattion of previous sentence fragment) adds to activation pattern
  + Context is excitatory
* So language process predicts upcoming words
* SIE data:
  + Preceding wordshave relation to verb (anomalous) so they facilitate retrieval of lexical features of target word🡪No N400
* Biphasic N400/P600 effects
  + No priming🡪N400

P600 as Mental Representation Composition

* P600 can’t just be syntactic revision cuz findings
* P600 in irony
* P600 materials require additional processing to understand
* Comprehending a story/sentence reading constructs mental representation of what is communicated (MRC)
* Hypothesis: P600 effects are construction, revision, or updating of MRC
* SIE🡪trouble constructing MRC

Vissers, C. et al. (2013). The interplay between mood and language comprehension: Evidence from P600 to semantic reversal anomalies. *Neuropsychologia, 51*, 1027-1039

* Interaction between plausibility of a sentence and mood
* No N400 effect in happy mood condition (between implausible and plausible sentences)
* Small N400 effect in sad mood conditions
* P600 effect in happy mood condition
* No P600 in sad mood condition

Discussion

* Heuristic processing probably plays large role in language processing🡪don’t always take all relevant information into account sometimes use good-enough representation of inguistic input
* Correlation between size of P600 and rating of happiness

Swaab, T. Y., Ledoux, K., Camblin, C., & Boudewyn, M. A. (2012). Language-related ERP components. In *Oxford handbook of event-related potential components* (pp. 397-439). New York: Oxford University Press.

The P600

* Syntactic positive shift
* Onset ~500 ms after stimulus onset
  + Peak at 600 ms
* Maximal over posterior electrode sites

The P600 and syntactic anomaly

* P600 indexes processes of structure building generally
* Lots of papers supporting this

The P600 and syntactic ambiguity

* Sentences syntactically difficult🡪P600 > sentences easier to parse
* Garden path sentence—first led down a specific syntactic path before realizing you have to change directions towards another
  + 🡪P600
* Theories of P600:
  + Cost of reprocessing that’s necessary when initial parse is disconfirmed (Osterhout et al. 1994)
  + Difficulty of syntactic integration (easier when syntactic structure is predictable) (Kaan et al. 2000)
  + Final stage of a 3-stage syntactic reanalysis when the first 2 stages (early phrase-structure building and semantic/verb-argument info activation) can’t be reconciled (Friederici 1995)
  + Amount of time required to unify syntactic frames into one phrasal configuration. Takes longer when syntactic ambiguity introduces more than one possible syntactic configuration (Hagoort 2003).

The P600 and Semantic-Thematic Integration

* P600 effects to seeming semantic violations(SIE)

The P600 and syntactic Priming

* Syntactic priming—facilitation of sentence processing that occurs when a sentence has the same syntactic form as a preceding sentence
  + Less consistently shown in studies of language ecomprehension
* Effects dependent on repetition of lexical items across sentences

Van de Meerendonk, N., Kolk, H., Vissers, C., Churilla, D. (2008). Monitoring in language perception: mild and strong conflicts elicit different ERP patterns. *Journal of Cognitive Neuroscience, 22*(1), 67-82.

Intro:

* We’re able to detect descrepency between speech element we tried to produce and the one we did produce and correct for it
* Conflict between what’s expected and what’s perceived 🡪reanalysis of input to check for processing errors🡪P600
* Semantic attraction between words🡪perceive grammatically corret sentence as ungrammatical (Kuperberg et al. 2003)
  + So they know something’s wrong but it can’t be semantics because of semantic attraction🡪must be syntax🡪P600
    - So they think the verb is wrong not the words
  + Ex. “for breakfast the eggs would eat toast”
    - Semantic attraction between all words so semantics totally ok and it must be a grammatical issue so the word “eat” should probably be “be eaten with” or something.
* Monitoring: response conflict, reanalysis, and resolution
  + 🡪P600
  + Kolk et al. 2003

Results and Discussion

* Mildly implausible sentences🡪N400 as compared with plaus
  + Integration difficulties resolved so no P600
* Deeply implausible sentences🡪N400 as compared with plausible
* Deeply implausible sentences🡪P600 as compared with plausible
* P600 likely because conflict between expected and actual

Davenport, T., Coulson, S. (2011). Predictability and novelty in literal language comprehension: An ERP study. *Brain Research, 1418*, 70-82.

Introduction:

* Creative extension of meaning in language involves mapping (constructing correspondences between conceptual domains)
* Figurative language and semantic mapping
  + When context supports a metaphorical interpretation a metaphorical mapping between domains can be accessed without cognitive system having to first consider an anomalous view
  + N400 conventional literal < novel literal < novel metaphor
    - Coulson & van petten (2002)
  + Late positivity increased in novel literal (frontal) and novel metaphorical (posterior)
    - Due to semantic distance between two domains being connected
      * Cardboard box and boat
* Present study
  + Replicate Coulson and van petten (2002)

Results/Discussion

* Compare ERP effects of predictability and semantic conventionality for sentence-final words in high cloze (predictable) conventional (HC) (predictable), low cloze (unpredictable) conventional (LC), and low cloze novel (LN)
* HC N400 < LC
* HC 500-900ms positive < LC
* LC & LN = N400s