

Introduction

- Syntactic processing may draw upon general executive mechanisms which detect and resolve conflict between competing representations (1, 2).
- The **Syntactic P600** ERP component (3,4) is largest in the presence of conflict between an ill-formed syntactic representation and a conflicting constraining semantic context (5,6).
- Executive conflict processing is dynamic: more conflict leads to the recruitment of more cognitive resources, facilitating later conflict resolution (7).
- In tasks of executive function (e.g. the Stroop), this dynamic adjustment of control manifests as the Gratten effect: it is easier to process conflict trials which follow other conflict trials than those which follow non-conflict trials (8).

Our Question

- Is the Syntactic P600 subject to a dynamic adjustment of control?
- We used ERPs to determine whether the P600 evoked by syntactic anomalies in sentences is modulated by **trial history**.

Methods

- Four ERP experiments with simple, active English sentences containing **syntactic violations** or **real-world violations** on verbs. These produce a P600 and N400 effect respectively.
- We focused on the contrast between violations following normal sentences and violations following sentences including the same type of violation.

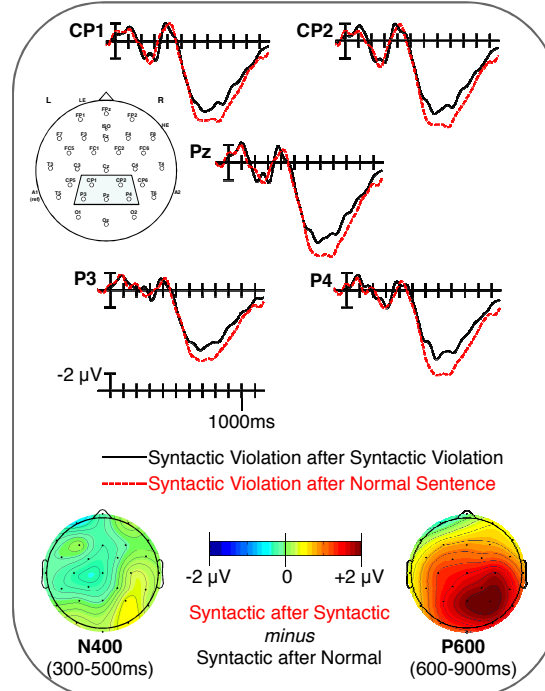
Example sentences (the critical verb to which ERPs were time-locked is underlined)

- Normal sentence with no violation:
Before operations surgeons should always scrub...
- Sentence with syntactic violation:
Before operations surgeons should always scrubs...
- Sentence with real-world violation:
Before operations surgeons should always disobey...

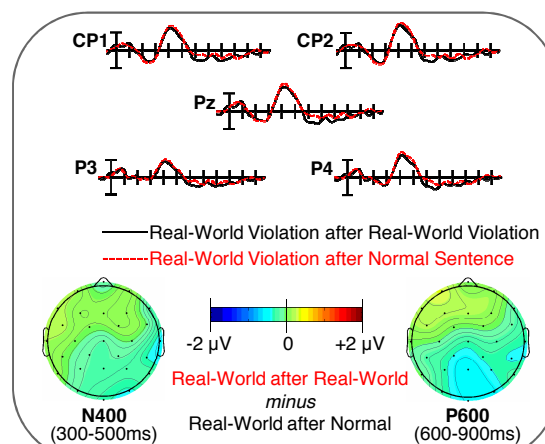
Results

Grand-average ERPs across 4 Experiments

Syntactic Violations:



Real-World Violations:



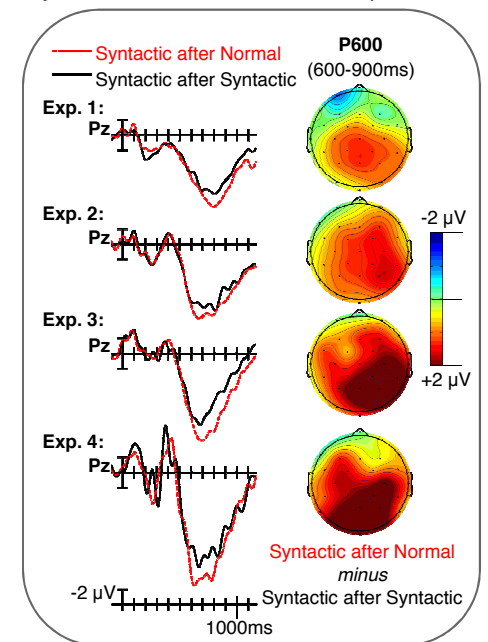
Details of participants and experimental design for individual studies

Name of study	Participants	Female	Average age	Lists	Stimuli per Condition			Stimulus parameters
					Normal	Syntactic	Other	
1. Kuperberg et al., <i>Language and Cognitive Processes</i> , 2006	20	4	41	4	60	60	60	SOA: 550ms (SF: 1200ms)
2. Dittman, Holcomb and Kuperberg, <i>Psychophysiology</i> , 2007	18	9	20	3	60	60	0	Self-paced (SF: 700ms)
3. Wang et al., <i>Abstract, Cognitive Neuroscience Society</i> , 2010	16	8	19	4	45	45	68	Self-paced (SF: 700ms)
4. Paczynski & Kuperberg. In prep.	18	9	20	3	60	60	—	Self-paced (SF: 700ms)

Number of trials included and number of trials rejected for artifact in the conditions examined. For all experiments, number of trials is averaged across lists, and number of trials rejected is averaged across subjects.

Experiment		Normal	Syntactic following normal	Syntactic following syntactic	Real-world following normal	Real-world following syntactic
1.	Trials	14.4 [2.2]	16.0 [4.0]	12.8 [1.0]	15.7 [2.9]	
	Rejected	1.8 [2.5]	1.3 [1.8]	0.8 [1.1]	1.2 [1.6]	
2.	Trials	23 [0]	20 [0]	18 [0]	25 [0]	
	Rejected	2.7 [1.3]	2.4 [1.8]	2.1 [1.5]	3.2 [2.2]	
3.	Trials	15 [0]	12 [0]	17 [0]	11 [0]	
	Rejected	2.1 [2.1]	2.4 [2.0]	2.5 [3.0]	1.2 [1.3]	
4.	Trials	24.7 [2.1]	14.5 [2.8]	—	—	
	Rejected	2.0 [2.3]	1.2 [1.4]	—	—	

Syntactic Violations, Individual Experiments:



Conclusions

- **Clear effect of trial history on the P600 evoked by syntactic violations:** when preceded by other syntactic anomalies, the amplitude of the P600 was smaller than when preceded by non-violated normal sentences.
- Some degree of specificity: No effect of trial history on the N400 to real-world violations.
- Not easily explained by lexically-mediated syntactic priming
- Aspects of the processing of syntactic violations may be subject to similar dynamic control operations to those that characterize classic tasks of executive function.

References

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