Evidence for Syntactic Priming in Minimal Phrases as revealed by Event-Related Brain Potentials

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Introduction

Background:

A large number of behavioral studies have provided consistent evidence that words are recognized faster when they are presented in syntactically appropriate context [1, 2]. To date, the possible impact of such syntactic priming effects on syntactically related components of the event-related brain potential (ERP) has attracted surprisingly little attention. In particular, syntactic priming may play an important role for early components observed in response to local syntactic violations in studies investigating online sentence processing with ERPs.

The Present Study:

Syntactically correct German pronoun-verb phrases were contrasted with equivalent phrases violating subject-verb agreement in a violation detection paradigm. A completely crossed design as well as a strict acoustic control of the auditory stimuli allowed for a precise assessment of ERPs to verb inflections as modulated by the correctness of the preceding syntactic context.

Hypotheses:

- Under the assumption that syntactic context primes following syntactic information, inflectional suffixes preceded by a mismatching pronoun should elicit an early negativity in the ERP.
- Given the active nature of the paradigm, it is likely that incorrect phrases further trigger a P600, which is consistently found in response to syntactic violations under controlled processing demands [3, 4].

Methods

1 Design & Stimuli:

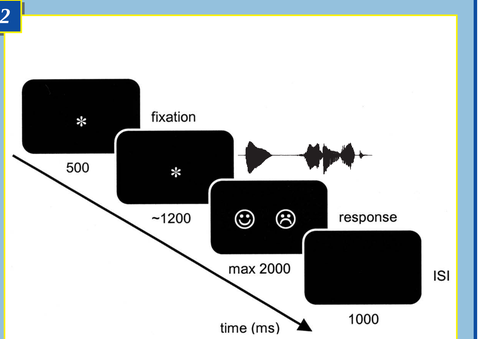
Condition	Auditory Stimulus Example (1 out of 50)			
	syntactic context	verb	target	engl. Transl.
t_cor	e r	r u d e r	t	he rows
t_inc	* e r	r u d e r	s t	*he row
st_cor	d u	r u d e r	s t	you row
st_inc	* d u	r u d e r	t	*you rows

* syntactically incorrect
equal colors mark acoustically identical material

Procedure:

- 24 healthy right-handed native speakers of German (12 female; 20-29 years) were instructed to judge the correctness of each phrase
- presentation of the phrases in a pseudo-randomized order via headphones
- sequence of events per trial:

2

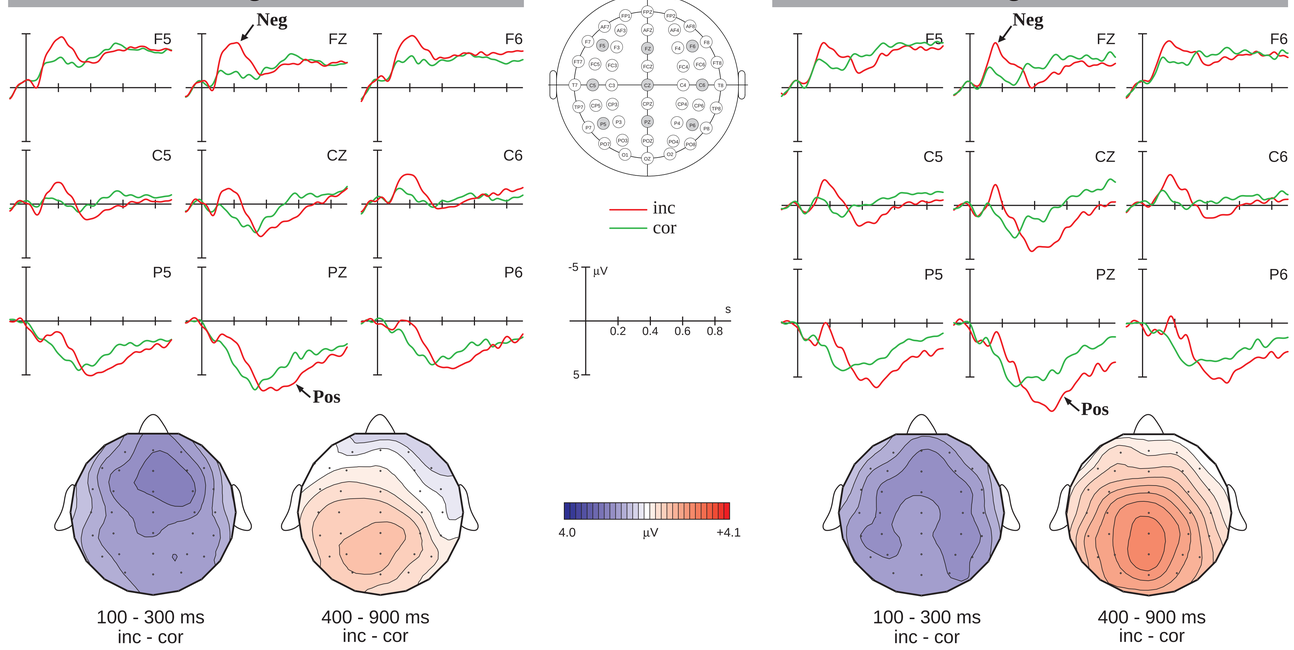


EEG Recording:

- DC to 135 Hz with 60 Ag/AgCl electrodes at a sampling rate of 500 Hz
- Online reference = nose; offline rereferenced to linked mastoids
- Calculation of ERPs per condition -100 – 900 ms with respect to target onset

Results

3 ERPs: syntactic context effect



Inflectional suffixes preceded by a mismatching pronoun elicited

- a broadly distributed early negativity; 100 – 300 ms: $F_{1,23} = 17.99$; $p < 0.001$
- a subsequent posterior positivity; 400 - 900 ms: $F_{1,23} = 17.12$; $p < 0.001$

There were no significant differences between the two correct or the two incorrect conditions in these time windows.

Behavioral responses:

- Mean RT = 293 ms
- Mean % correct = 99,6
- no significant differences between conditions

Discussion

Early Negativity

The early onset and broad topography of the negativity for syntactic mismatch conditions suggests that it reflects a very fast and effective mechanism detecting deviations from a primed syntactic input. This effect is in line with two previous ERP studies using similarly concise stimulus material [5,6]. However, its timing and topography are inconsistent with the left anterior negativity (LAN; 300-500 ms) usually observed in response to subject-verb agreement and other morphosyntactic violations [3, 4]. Although it remains to be investigated whether this discrepancy is due to methodological or functional differences, the current data clearly show that local violations of subject-verb agreement can be detected at a very early processing stage under the influence of syntactic priming.

Late Positivity

The characteristics of the enhanced positivity for incorrect phrases suggest that it represents a P600 component which is thought to reflect integrational difficulties as well as processes of syntactic reanalysis and repair [7].

Conclusion

The current data identify syntactic priming as one important factor for the fast and effective processing of local syntactic dependencies during auditory sentence processing.

References

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