Testing automaticity of syntax using subliminal priming: A behavioral assessment in German language

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Introduction

Previous EEG studies on the automaticity of syntax employed paradigms involving *conscious processing only* (e.g. Hahne & Friederici, 1999).
A link between syntactic processing and unconscious perception has been poorly studied so far (Berkovitch & Dehaene, 2019).
Our aim: Test the automaticity of syntax in minimal syntactic constructions using subliminal syntactic priming with real primes and non-primes.

Hypothesis

Experiment 1: REAL PRIMES

(1) Subliminal syntactic priming effect in minimal syntactic constructions
(2) Replication of B&D 2019 (French) for German language

Hypothesis

Experiment 2: NON-PRIMES

(1) Masked context: effect of category (longer RTs for verbs)
(2) Masked/unmasked context: the pronoun ER primes verbs

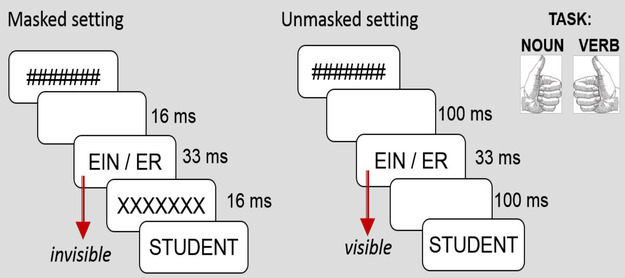
Methods

REAL PRIMES

(Prime, Category, Masking)

N=36	NOUN (N=40)	VERB (N=40)
DET	EIN HUT a hat	*EIN KAUT a chews
PRO	*ER HUT he hat	ER KAUT he chews

Procedure



Prime visibility
d′ / Marascuilo test

Priming analysis
ANOVAs
post-hoc comparisons

Normalization
Removes the category effect
$RT_{(EIN + NOUN)} - RT_{(FTN + NOUN)}$
$RT_{(ER + VERB)} - RT_{(FR + VERB)}$

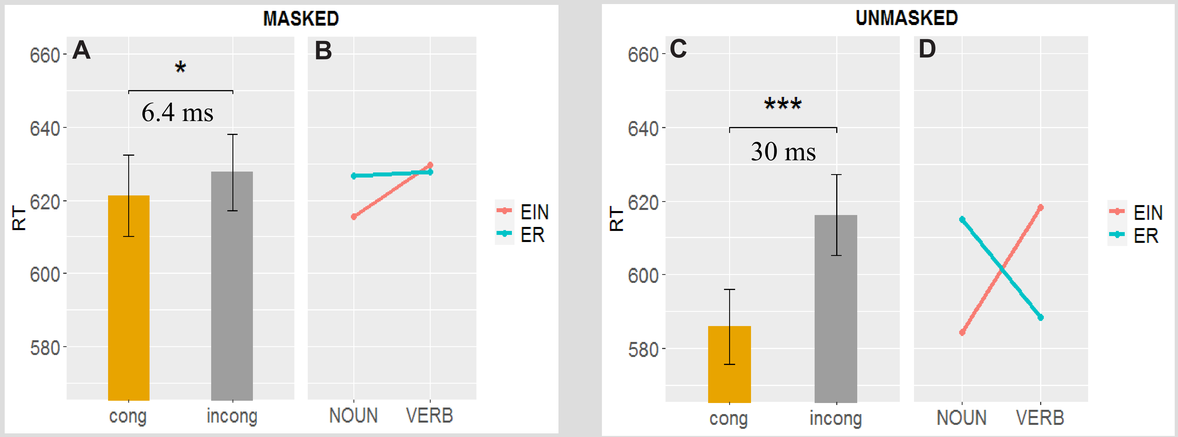
REAL PRIMES & NON-PRIMES

(Prime, Category, Masking, Lexicality)

N=39		NOUN (N=40)	VERB (N=40)
DET	real	EIN HUT	*EIN KAUT
	non	FTN HUT	FTN KAUT
PRO	real	*ER HUT	ER KAUT
	non	FR HUT	FR KAUT

Results

REAL PRIMES

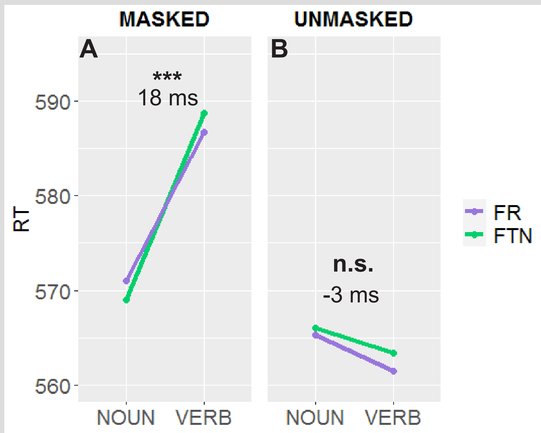


A: Congruency effect: incong. vs. cong.
B: Prime×Category; ER doesn't prime?

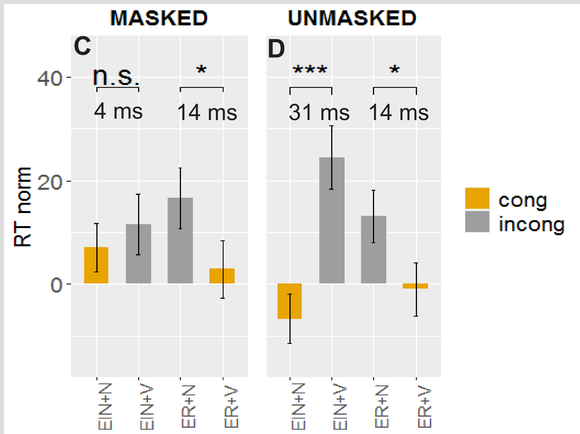
*** p<0.001
* p<0.05

C: Congruency effect: incong. vs. cong.
D: Prime×Category; ER and EIN prime

NON-PRIMES



REAL PRIMES – NON-PRIMES



A: Category effect
B: No category effect

*** p<0.001
* p<0.05
n.s. non-significant

C: ER primes; EIN not
D: ER primes; EIN primes

Discussion

(1) Exp. 1 and 2 replicate the subliminal syntactic priming effect reported by B&D (2019) with a larger sample size for German.
(2) The data suggest high automaticity of the early stage of syntactic structure building.
(3) At the early stage of syntactic processing, masked pronoun primes verbs by anticipating the functional morpheme *-t* on verbs. *Sensory hypothesis* (Dikker et al., 2009): human brain predicts perceptual features associated with a certain word category on the basis of the local context.

References:

Berkovitch, L. & Dehaene, S. (2019). Cognitive Psychology, 109:26–46. **Dikker, S., Rabagliati, H., & Pylkkänen, L.** (2009). Cognition, 110(3):293–321. **Hahne, A. and Friederici, A.** (1999). Journal of Cognitive Neuroscience, 11(2):194–205.