

WHEN THE N400 EFFECT REFLECTS POST-LEXICAL INTEGRATION RATHER THAN PREDICTIVE PROCESSES: THE CASE OF RELATIONAL SEMANTIC PRIMING

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BACKGROUND & RESEARCH QUESTION

The N400 ERP component has been associated with the cost of lexical-semantic processing. Its amplitude is reduced for primed targets. However, there are still controversies surrounding the mechanisms eliciting this effect.

DIFFERENT SEMANTIC PRIMING MECHANISMS

- ▶ **Automatic Spreading of Activation (ASA)**
Mandatory co-activation of associated nodes in semantic networks in LTM (long-term memory) during word retrieval
- ▶ **Expectancy or Prediction**
More controlled; In LTM and working memory (WM)
- ▶ **Post-lexical semantic integration (PLI)**
Primarily in Working Memory; subject to strategy and context effects

PREDICTIONS, POST-LEXICAL INTEGRATION AND LIST EFFECTS

- Lau et al (2013) reports N250 and N400 priming effects for lists with a high Relatedness Proportion (RP, 50% of related pairs) relative to lower levels of RP (10%). These two priming effects are thought to reflect facilitation resulting from respectively form-based prediction and semantic prediction.

- Steinhauer et al.'s (2017) priming experiment showed that related word pairs of a given semantic relationship (e.g., part-whole) showed stronger priming effects when embedded in a list with other prime-target pairs of the same (part-whole) relationship (consistent list, CON) than a different relationship (e.g., antonyms; inconsistent list, INC). Moreover, the consistency N400 difference (INC-CON) had a later onset (>400ms) than the traditional relatedness effect (unrelated word pairs vs. INC) starting at 300ms.

This consistency effect is compatible with WM-based post-lexical integration ('relational priming') but not with ASA. Alternatively, the short 250ms Stimulus Onset Asynchrony (SOA) may have led to delayed prediction-based priming effects.

- ▶ Does a longer SOA reduce the latency of the late N400 consistency effect as predicted by the expectancy-based mechanism?

MECHANISM	PREDICTED EFFECT OF CONSISTENCY
Prediction	Reduced negativity before 300 ms (N250 + early N400)
Post-lexical integration	Reduced negativity after 400 ms (late N400)

METHODOLOGY

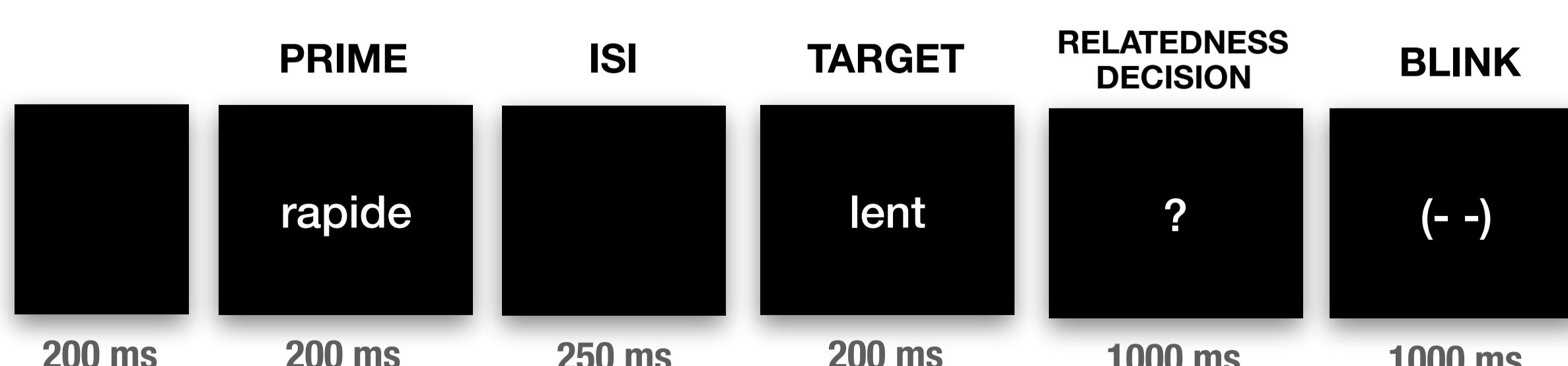
EXPERIMENTAL LISTS

TYPE OF PAIRS IN EACH BLOCK	80% CONSISTENT	10% INCONSISTENT	10% UNRELATED
Example for an 'antonyms' block:	rapide-lent 'fast-slow'	doigt-main 'finger-hand'	docteur-rideau 'doctor-curtain'

Same words were used to create all 3 conditions (across subjects). Presentation order was pseudo-randomized and counterbalanced across experimental lists.

SYNTACTIC CATEGORY	SEMANTIC RELATIONSHIP	EXAMPLES
Adjectives	ANTONYMS	riche-pauvre 'rich-poor'
	SYNONYMS	minutieux-méticuleux 'careful-meticulous'
	SUPERLATIVE-REGULAR	magnifique-beau 'magnificent-beautiful'
Nouns	ANTONYMS	origine-destination 'origin-destination'
	HYPERONYMS	guêpe-insecte 'wasp-insect'
	METONYMS	doigt-main 'finger-hand'
Verbs	ANTONYMS	infirmier-réfuter 'deny-refute'
	SYNONYMS	accepter-refuser 'accept-refuse'
	TROPONYMS (specific - generic)	déguster-manger 'savor-eat'

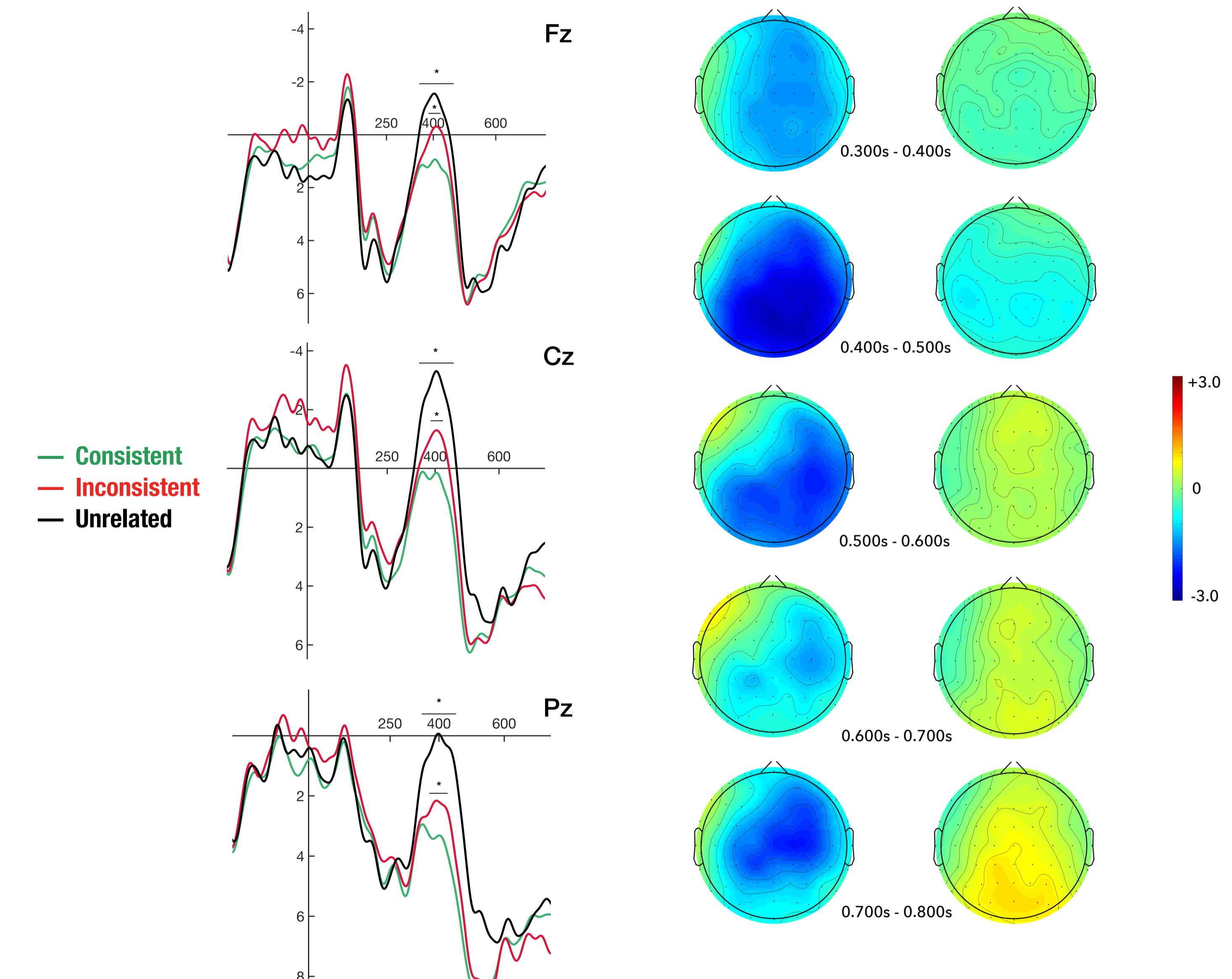
PROCEDURE



- ▶ **Stimulus Onset Asynchrony (SOA): 450 ms**

The EEG of 20 right-handed native French speakers was recorded while participants read, and subsequently judged the relatedness of 720 prime-target pairs distributed in 9 different blocks of 80 word pairs.

RESULTS



- ➡ Relatedness effect (UNR - INC) observed as soon as 320 ms until 580 ms
- ➡ Consistency effect (INC - CONS) starts just before 400 ms, until 450 ms
- ➡ No significant N250 modulation

CONCLUSION

N400 attenuation for semantically related prime-target pairs is significantly stronger when most other word pairs in the list have the same type of semantic relationship and the same word category. This consistency effect appears no later than 390 ms after target word onset and modulates the N400 within its classic time window (300–500 ms). Even with a longer SOA of 450 ms, we did not find any effect in the N250 or in the early N400 time windows that could reflect prediction of target words' formal features. Without excluding the role of expectancy or predictions in language processing, our effect seems best explained by context-driven post-lexical integration mechanisms.

- ➡ ASA-driven priming/word retrieval: 300–500 ms.
- ➡ Post-lexical integration: starts around 400 ms.

