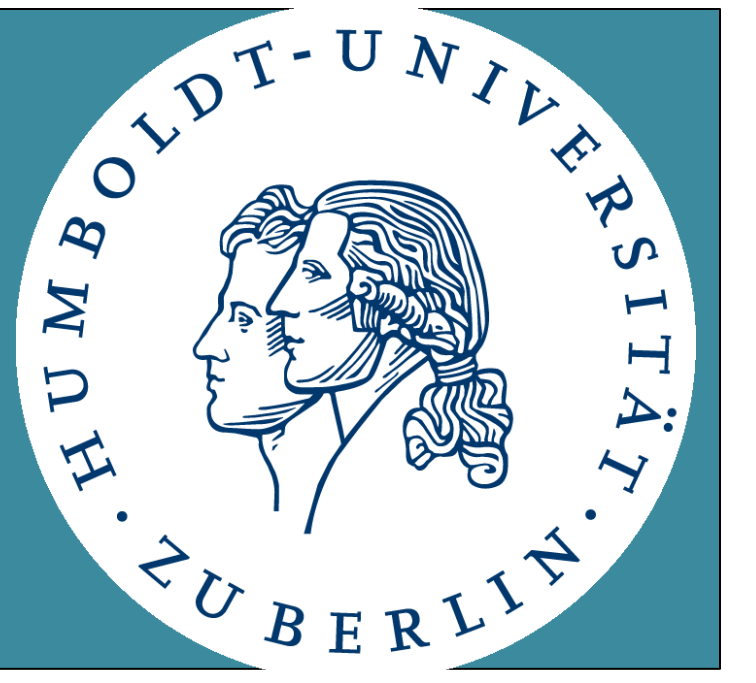


Lexical versus compositional world-language relations: Event-related brain potential effects during second language processing



Pia Knoeferle^{1,2,3}, Katja Maquate¹, Jennifer Lewendon⁴, & Carsten Schliewe¹

¹ Humboldt-Universität zu Berlin

² Einstein Center for Neurosciences Berlin

³ Berlin School of Mind and Brain

⁴ Bangor University

Contact: admin-psycholinguistik@hu-berlin.de

Abstract

- **Prior research:** L1 (English) language users exhibited rapid effects of verb-action and thematic role relations mismatches during sentence comprehension (Knoeferle et al., 2014)
- **The present pilot study** investigated the functional brain responses associated with verb-action and thematic role-relations mismatches in **L2 comprehenders** (L1: German, L2: English).
- **Hypotheses (pilot study)**
 - H0: no differences
 - AH1: If confident L2 English comprehenders are slower in picture-sentence verification than natives: delayed ERP mismatch effects compared with L1;
 - AH2: If confident L2 English comprehenders integrate picture & sentence representations like L1 comprehenders: replicate the full set of findings from Knoeferle et al. (2014).
- **Key results present study - no clear delays but some qualitative differences**

- **Subject noun:** reliably larger mean amplitude negativities to role relations mismatches vs. matches

- **Verb:** replicated larger mean amplitude negativities for action mismatches than matches in the N400 verb time window

- **Between-study differences:**
 - Role relations mismatch effects in the verb N400 time window
 - Failure to replicate role-relations mismatch negativity to object noun

References and Acknowledgements





Knoeferle, P., Urbach, T., & Kutas, M. (2014). Different mechanisms for role relations versus verb-action congruence effects: Evidence from ERPs in picture-sentence verification. *Acta Psychologica*, 152, 133-148.

We acknowledge funding by the Santander Mobility grant (JL).

Method

- **Participants:**
 - 16 right-handed monolingual German adults (18-30 years, f=8) with advanced knowledge of English (C1/C2)
- **Materials**
 - Materials and setup identical to Knoeferle et al. (2014), 80 critical + 160 filler items
 - See Table 1 for a critical item
- **Recorded EEG**
 - word-by-word rapid serial visual presentation
- **Design**
 - 2 (role match vs. mismatch) x 2 (action match vs. mismatch), yielding 4 conditions; see Table 1; Figure 1 for Trial Structure
- **Task**
 - Does the picture match the sentence? (Speeded Yes/No button presses; button position counterbalanced across participants)

Table 1: Example critical item and illustrated design

Picture	Sentence	Condition
	The ice skater _{subject_noun} pokes _{verb} the gangster _{object_noun} .	1a) Full match
	The ice skater _{subject_noun} pokes _{verb} the gangster _{object_noun} .	1b) Action mismatch
	The ice skater _{subject_noun} pokes _{verb} the gangster _{object_noun} .	1c) Role mismatch
	The ice skater _{subject_noun} pokes _{verb} the gangster _{object_noun} .	1d) Full mismatch

Method

- **Analyses (see Knoeferle et al., 2014)**
 - Only correctly answered trials
- **ERP layout (Figure 3)**
 - ERPs (0-100, 100-300, 300-500 ms)
 - subject noun (e.g., *skater*)
 - verb (e.g., *pokes*)
 - object noun (e.g., *gangster*)
- **Preprocessing:**
 - Bandpass filter 0.016-100 HZ
 - Baseline correction -200 for subject noun; -100 for verb and object noun
 - Offline re-referencing to average of left and right mastoid
 - Epochs with artifacts (e.g., blinks) excluded
- **Omnibus ANOVA** with role (match vs. mismatch), action (match vs. mismatch), hemisphere (left vs. right), laterality (lateral vs. medial) and anteriority (5 levels) as factors
- **Procedure**

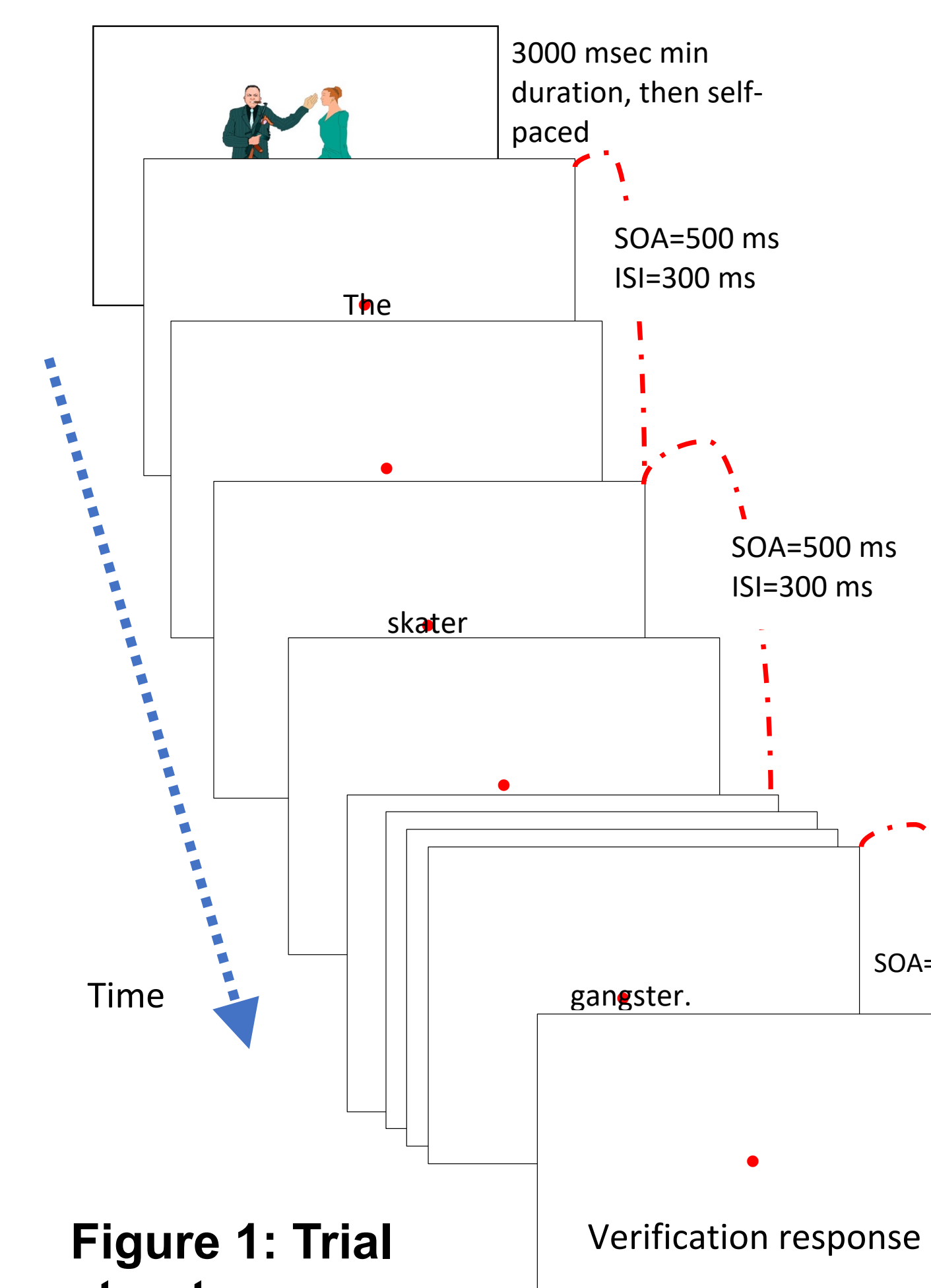
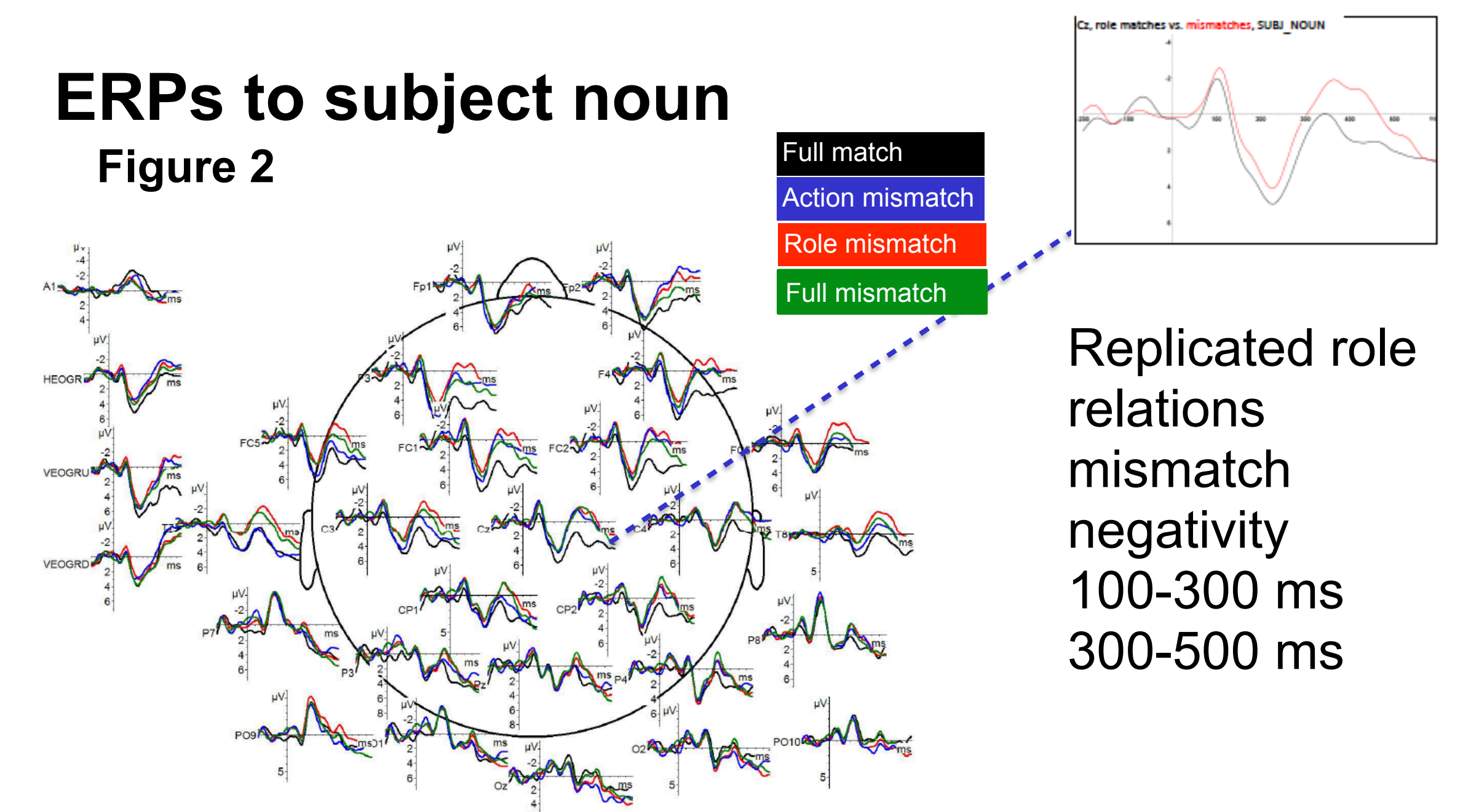


Figure 1: Trial structure

Results

ERPs to subject noun

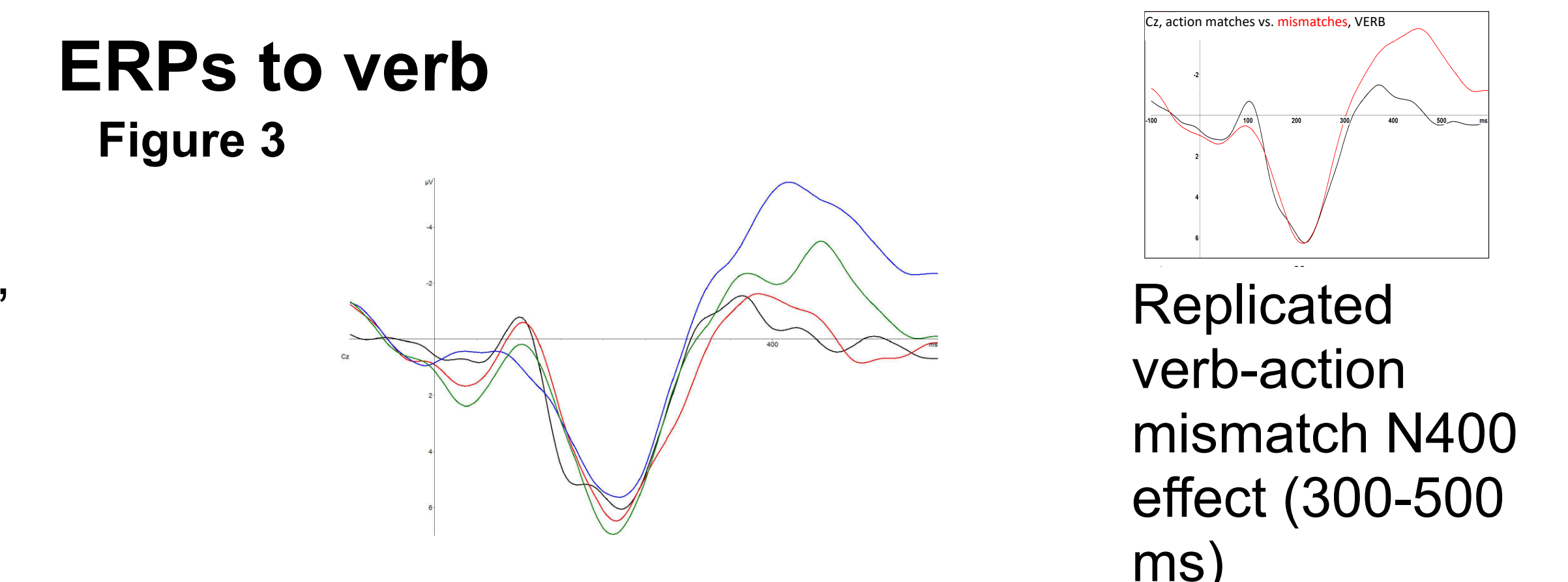
Figure 2



Replicated role relations mismatch negativity 100-300 ms 300-500 ms

ERPs to verb

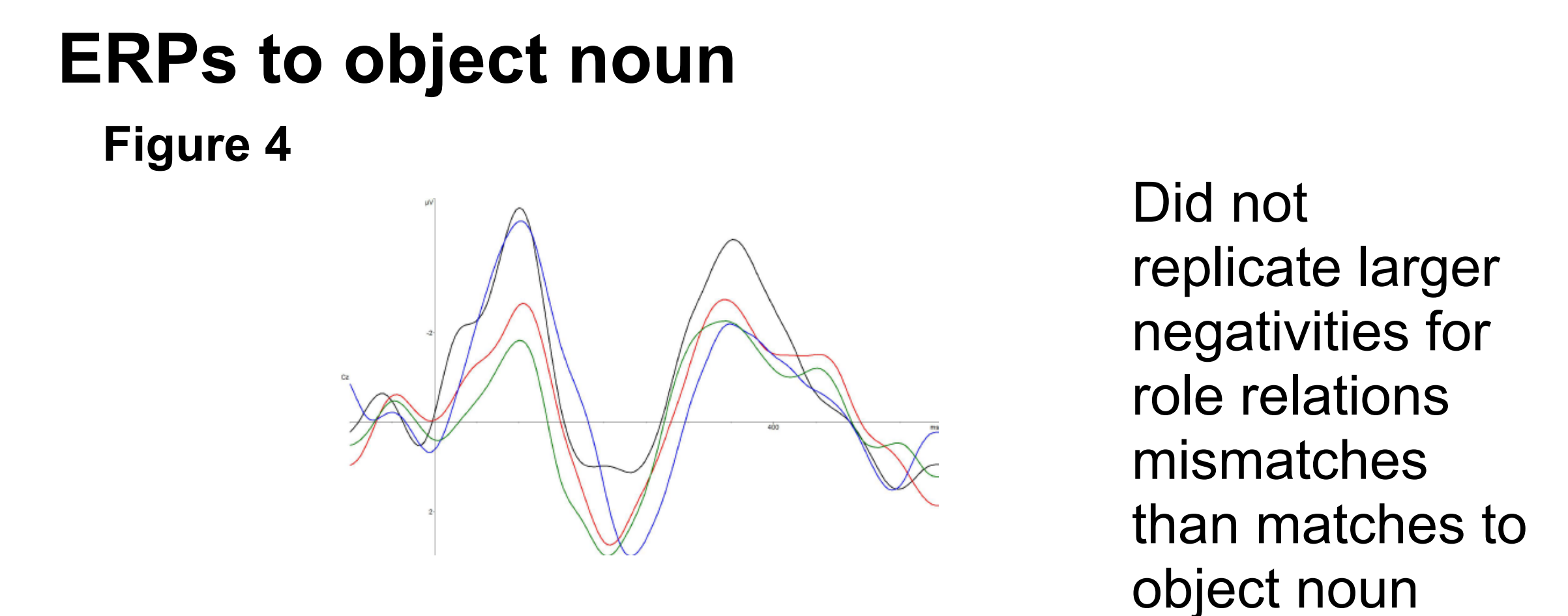
Figure 3



Replicated verb-action mismatch N400 effect (300-500 ms)

ERPs to object noun

Figure 4



Did not replicate larger negativities for role relations mismatches than matches to object noun

L1 comprehension (Knoeferle et al., 2014):

- **Verb:** main effect of action only
- **object noun:** larger mean amplitude negativities over left-anterior sites (role relations mismatches than matches)

L2 comprehension (present study):

- **verb:** larger mean amplitude negativities for role mismatches than matches (300 – 500 ms, Fig. 4)
- **early object noun** more positive-going mean amplitude to role mismatches than matches (*gangster*, 0 – 100 ms and 100 – 300 ms)