

Spanish Stress Perception – an ERP analysis

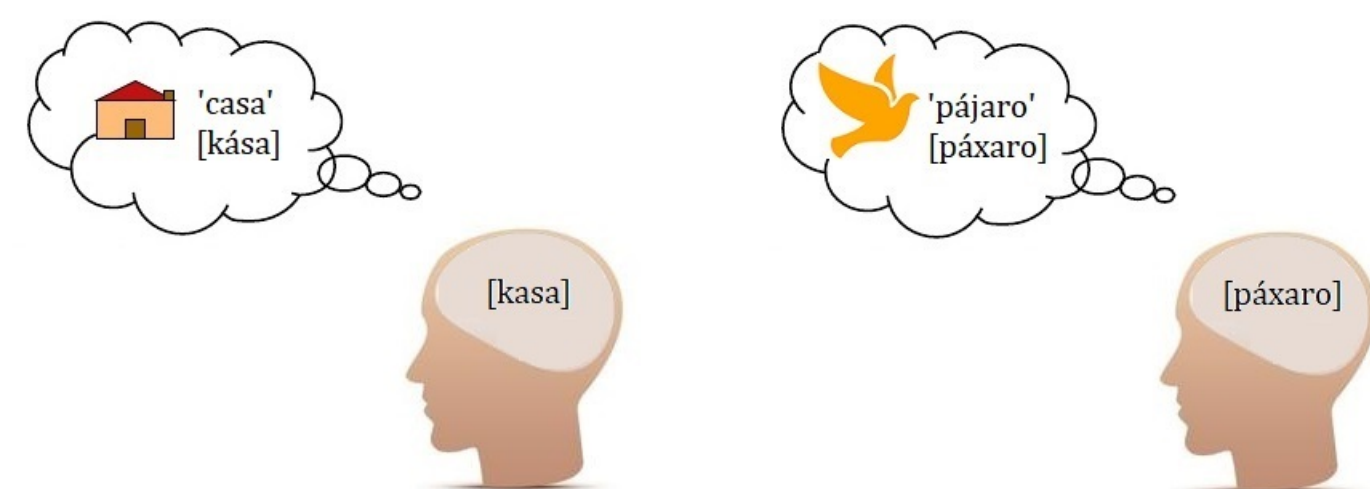
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Theoretical assumptions and project aims

Generative phonology standpoint: predictable, derivable information is **not** stored in long-term memory. Mechanical, purely acoustic detail speakers are unaware of is excluded from the deep representation.

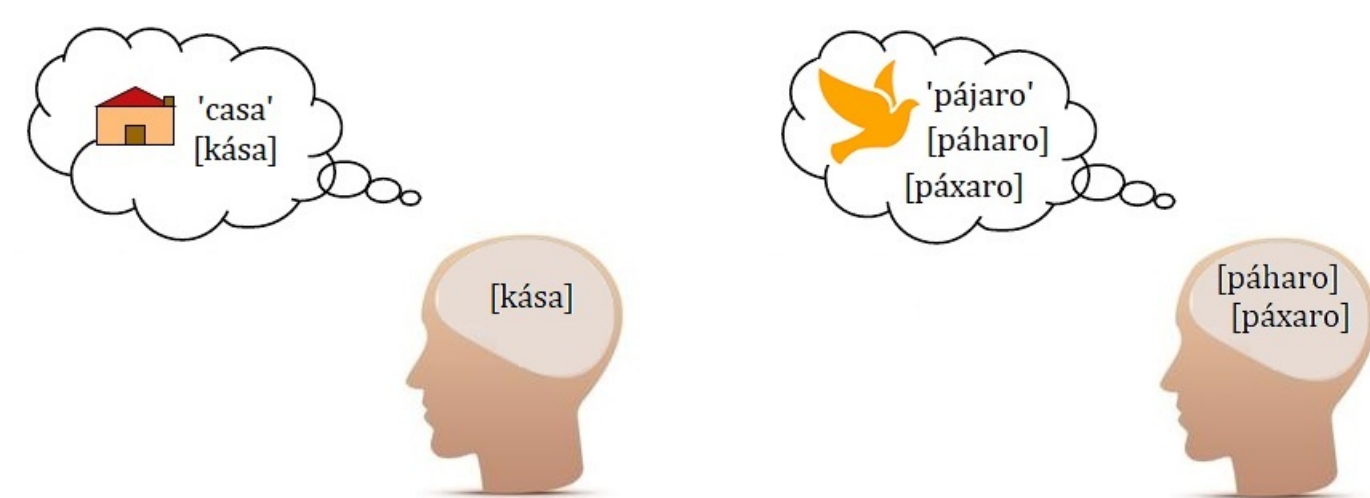
Only phonemic information is systematically accessed by the brain.

Lexical stress in languages with contrastive word stress or with lexical exceptions has to be stored as no rule can be learned that derives it.



Exemplar theory: the brain stores rich representations, i.e. all the acoustic, perceptual and other details.

The differences in access to words are based purely on the relative frequency of a given word or pattern.



Aim of the project:

- investigate stress processing by speakers of a language with variable stress
- test the generative hypothesis on phonological information storage
- confront native speakers with a non-native pronunciation (incorrect stress) to explore the process of **lexical inhibition**
- compare default and exceptions & physiological with behavioural data

Why Spanish?

Previous studies on the perception of stress showed that:

- there is a negativity effect (N400) in response to incorrectly stressed words (Knaus et al. 2007, German)
- there is a substantial negative response to incorrect stress in exceptions as opposed to the default (Domahs et al. 2012, Turkish)

Spanish has 3 stress patterns: final, penultimate, antepenultimate

- Stress is contrastive in verbs and some verb-adjective pairs but not in nouns

Penultimate = 70%

seMAAna 'week'
miNUTo 'minute'
CAsa 'house'
estuPENdo 'great'

Antepenultimate = 15%

MEtoto 'method'
COdigo 'code'
espeCIfico 'specific'
peRIOdico 'newspaper'

Methodology

Correctness judgment task with auditory stimuli recorded with a native speaker of Spanish

Participants: 32 native speakers of Spanish from Spain aged 20-35

Stimuli: 120 correctly stressed and 120 incorrectly stressed nouns (plus 120 distractors) embedded in carrier sentences

Carrier sentences

[NAME:]

Pedro / Lupe / Pablo / Laura /
Marta / Sara / Dani / Sonia

['pronounced the word'] pronunció la palabra

[TARGET WORD]

['again'] otra vez

Word types: trisyllabic nouns with a CVCVCV structure stressed on the penultimate (default) or on the antepenultimate syllable (exception).

Words from the two patterns chosen with matching frequencies (EsPal corpus, log count, frq), controlled for phonological neighbours.

Standards

PUs

caBEza 'head' 4.830 (220)
lleGAda 'arrival' 4.350 (72.87)
choRizo 'chorizo' 2.667 (1.51)
piJAma 'pyjamas' 2.558 (1.17)

APUs

MUtica 'music' 4.825 (217)
MEtoto 'method' 4.345 (71.96)
LObulo 'lobe' 2.666 (1.5)
BUfalo 'buffalo' 2.579 (1.23)

Deviants

PUd

CABeza 'head'
LLEgada 'arrival'
CHOrizo 'chorizo'
PIjama 'pyjamas'

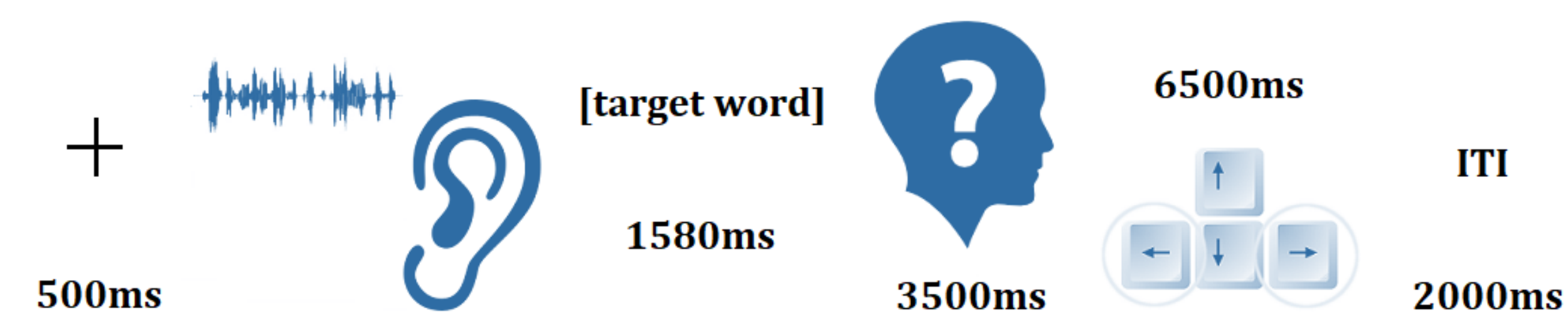
APUd

muSica 'music'
meTOdo 'method'
loBUlo 'lobe'
buFAlO 'buffalo'

Words presented in 2 blocks:

Block 1: 30 APUs + 30 APUD + 30 PUs + 30 PUD + 60 dist = 180

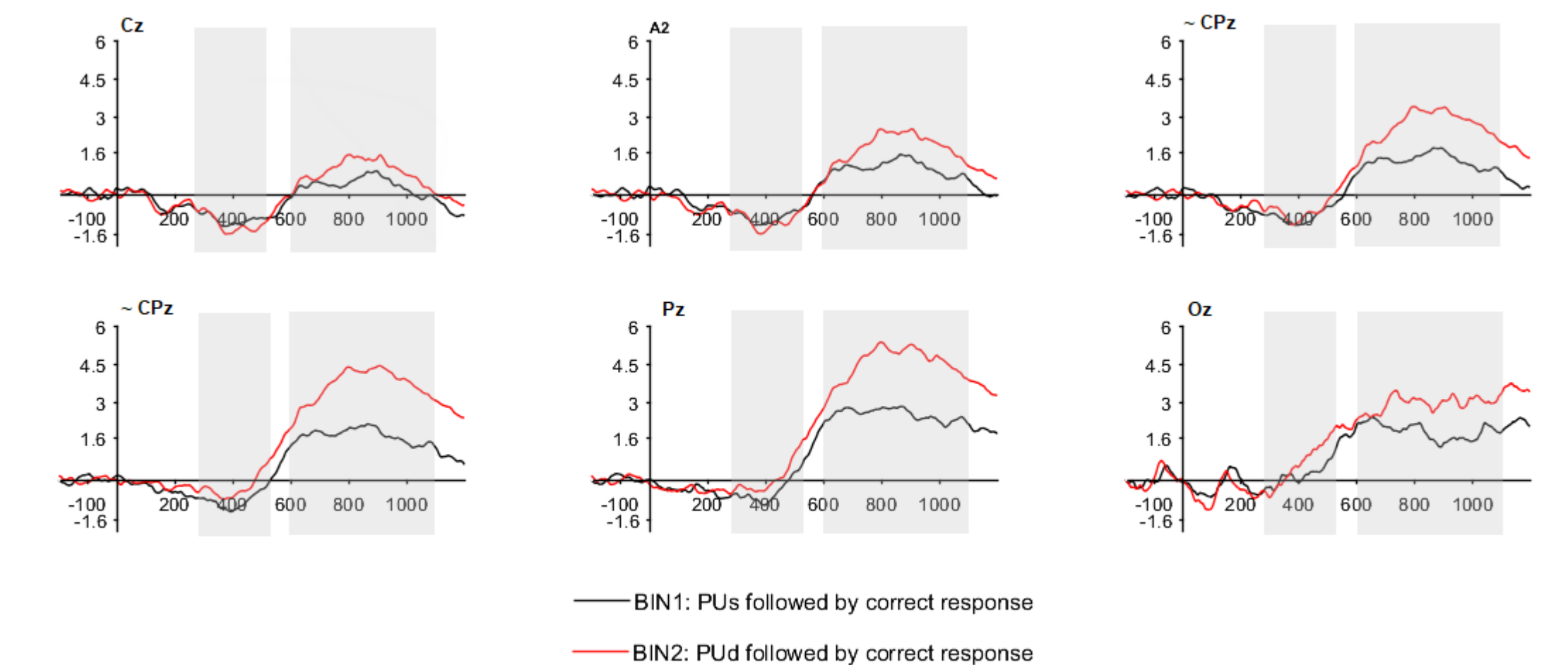
Block 2: 30 APUs + 30 APUD + 30 PUs + 30 PUD + 60 dist = 180



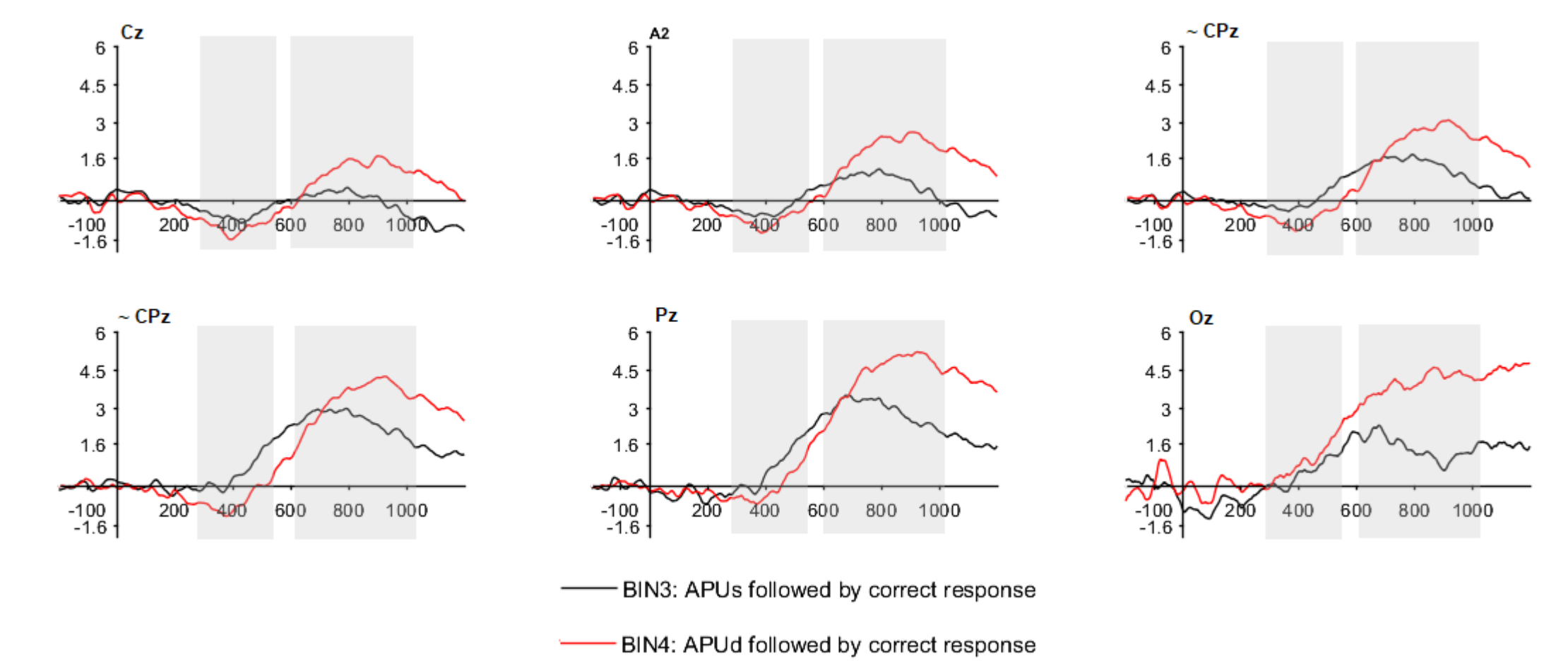
Measurements: electrophysiological data (128-electrode Biosemi equipment), behavioural data (% correctness, reaction times)

Expectation: deviants trigger a late negativity response related to lexical/semantic processing due to the delayed comprehension of the word (N400) and a task-related positivity effect (e.g. P300).

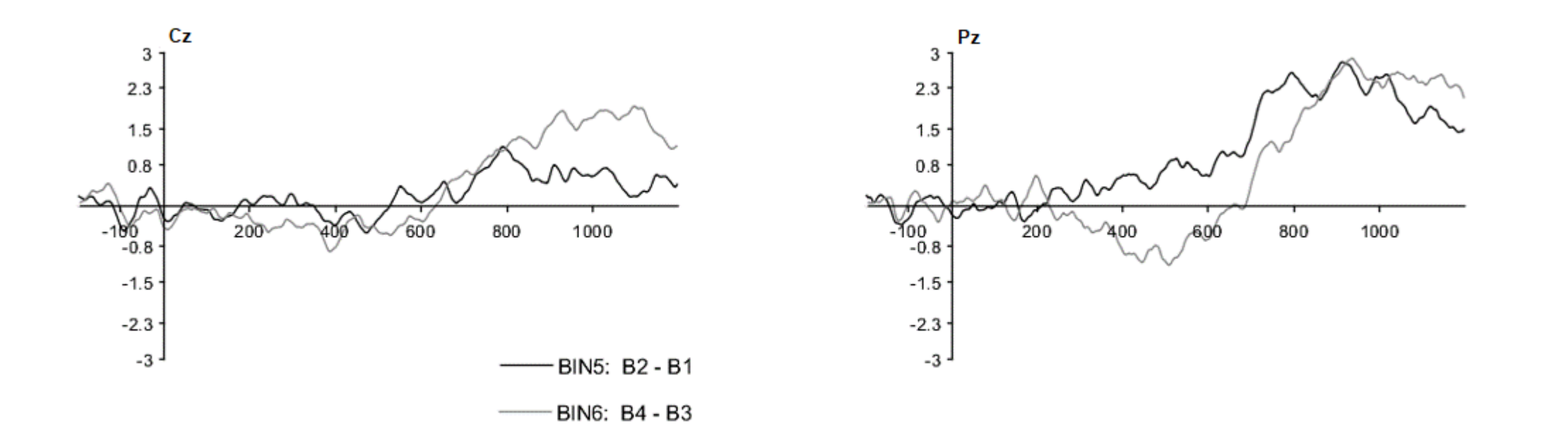
Preliminary results



In the PU condition, there seems to be no negativity effect and a substantial late positivity effect peaking around 800ms from target word onset.



In the APU condition, there seems to be a slight negativity effect and a substantial late positivity effect peaking around 900 ms from target word onset.



- Difference waves at Cz and Pz (and other centroparietal sites) confirm that there seems to be an enhanced negativity response after hearing a deviant with stress on the penultimate instead of antepenultimate syllable.

- There seems to be no ERP timelocking to the syllable of interest depending on the condition apart from a slight rightward shift in the N400 and in the LP, which may be due to:

- the need to wait until the second syllable to determine stress in both PU and APU deviants (APU stress is usually marked by pitch rather than duration, the first syllable being quite short)

- the need to wait until the whole word is understood based on segmental and phonological information

*The data are based on 27 participants. The correctness and artifact rejection thresholds were set at 75%.