Global and Specific Expectations: Identifying Social Factors that Reduce Code-switch-related ERPs

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INTRODUCTION

- Bilinguals shift between languages in natural discourses, a behavior known as code-switching, with ease during day-to-day communication.
- However, substantial costs associated with code-switches relative to non-switched words had been reported in previous studies
  - Longer processing time behaviorally
  - Amplified event-related potential (ERP) components related to language processing
- **Interlocutor-based anticipation**
  - Listener predicts whether the speaker would code-switch or not based on the listener's social identity (e.g., education, social status, age, etc.)
- **Switch-based anticipation**
  - Based on whether a particular word is expected to be switched (natural-switch pattern) or not (random-switch pattern) according to social conventions within a particular language community

QUESTIONS

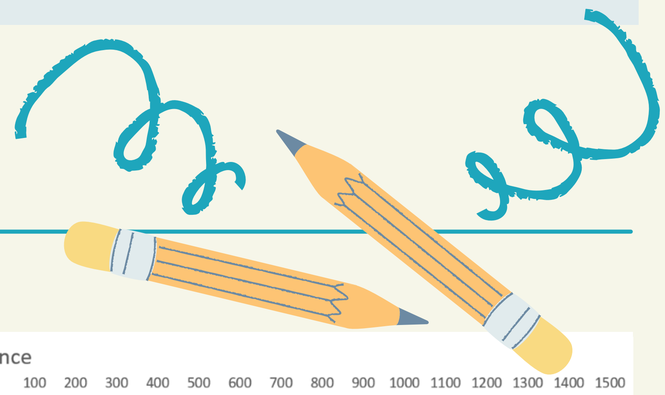
Can two types of expectations, **interlocutor-based** and **switch-based** anticipation, **modulate the neural costs** related to intra-sentential code-switching (switching between languages within a sentence)?

HYPOTHESES

1. **N400 amplitude** (amplified negativity was reported when the lexical-semantic integration of a word into a sentence was more difficult): **Random > Natural switches**
2. **Late positivity complex (LPC) amplitude** (positivity associated with the more difficult high-level representation of meaning established and built during comprehension): **Unfit > Fit speaker background**

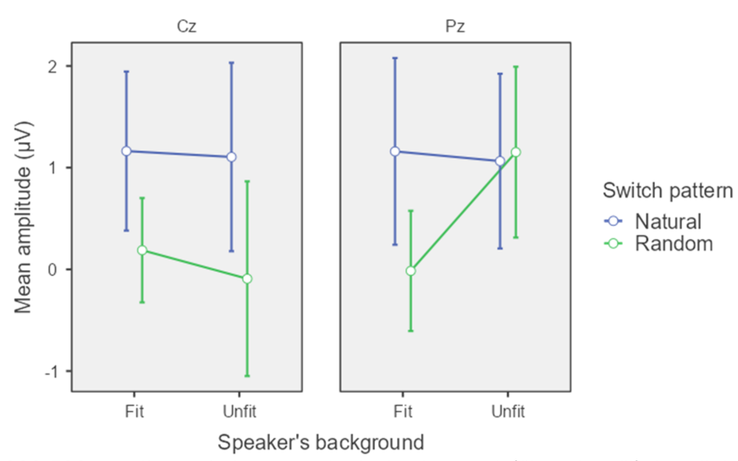
METHODS

- Using **electroencephalography** (EEG) in a reading paradigm, where interview transcriptions were presented word-by-word, **30 Cantonese-English bilinguals** were tested
- A speaker with different backgrounds (**fit or unfit**) was presented to the participant, then the speech they produced was **naturally switched**, **randomly switched**, or **monolingual** (non-switched)
- Repeated-measures ANOVA on the difference waves between the switch and non-switch conditions using the within-subject factors speaker's background (fit and unfit) * switch pattern (natural and random switch) * two centro-parietal electrodes (Cz and Pz)

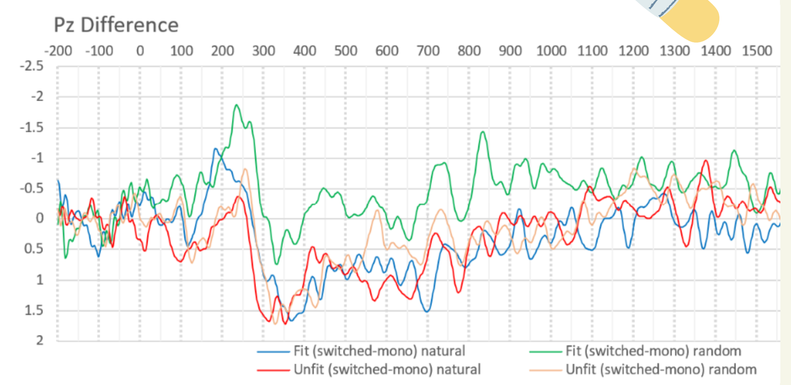


RESULTS

- **N400** (300-500 ms): ✔ ?
  - Code-switch conditions did not elicit a more negatively-going wave. In contrast, across all conditions, the code-switch conditions elicited more positivity in comparison to their monolingual controls
  - Mean amplitude: negative in the random-switch condition than the natural-switch condition, but only when code-switching was expected based on the speaker's background (fit but not unfit).
- **LPC** (500-900 ms) ✖
  - No significant main or interaction effects were found in the LPC time window



300-500 ms time window: speaker's background (fit and unfit) * switch pattern (natural and random switch) * two centro-parietal electrodes (Cz and Pz). In general, the mean amplitudes were more negative in the random-switch conditions than the natural-switch conditions, but only when the speaker's background was fit and not unfit.



ERP difference waveforms at the Pz electrode. Difference waveforms were computed by subtraction: four switched conditions (fit-switch-natural, fit-switch-random, unfit-switch-natural, and unfit-switch-random) minus their four monolingual counterparts (fit-mono-natural, fit-mono-random, unfit-mono-natural and unfit-mono-random, respectively).

DISCUSSION

Based on the results, we give the following interpretation:

- The **N400 effect**, typically associated with the cost of lexical-semantic integration of meaning, was **sensitive to if the code-switcher was deemed fit to switch**, and **only then would he/she be judged based on whether the switches were following a conventional pattern** (natural-switch) or not (random-switch).
- However, interpretation of the current findings must be cautioned due to **methodological concerns** in the use of the visual presentation modality, stimuli production, and the under-verified novel manipulation techniques. In particular, the code-switched conditions were unexpectedly more positive than non-switched conditions, and only through the difference waves obtained by subtracting the non-switch conditions from the switched ones could we find more negativity in the unfit-random condition. Future studies with more careful control in stimuli production and/or using the auditory modality are recommended.
- The findings in the current study **advanced our understanding of the interaction between social factors and the expectation framework in the context of bilingual communication**.