

Signaling Functions of Code-Switching: Evidence from Production Data and ERPs

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In bilinguals, code-switching (changing languages in the middle of a sentence) is ubiquitous. Code-switching has pragmatic, communicative and cognitive functions. It can also signal specific upcoming information. Previous studies have shown that code-switching often precedes information that is less expected [1, 2]. Bilinguals can use this as a cue that unusual information is coming up, which might facilitate the processing of this information [3].

To investigate this signaling function of code-switching, we conducted (Study 1) two cloze-completion experiments and (Study 2) two ongoing ERP experiments with two groups of highly proficient bilinguals. Participants are (i) late bilinguals with L1 German and L2 English (GerEng), and (ii) early bilinguals with L1 Spanish and L1/L2 English (SpaEng). The studies were preregistered. In Study 1, participants (GerEng $n=124$, SpaEng $n=122$) read highly constraining sentences with the final word omitted. The material preceding the blank was either (1a) entirely in English (based on [4]), and (1b) contained a switch from German to English or (1c) from Spanish to English. Participants were instructed to enter the first continuation that came to mind. If code-switching signals less expected content, we expected the completions to converge more strongly in the unilingual (1a) compared to the code-switching conditions. The studies were run in PCIBex [5]. Participants were 18–35-year-old adults assumed to have experience with code-switching in texting. We also collected data on proficiency in the L2 as well as language and code-switching profiles.

Cloze-probability analyses showed clear group-specific patterns. For GerEng (Figure 1), the highest cloze probability words did not differ between the code-switching and unilingual English conditions ($b=0.009$, $SE=0.01$, $p=.38$). In contrast, SpaEng (Figure 2) showed significantly lower cloze probabilities in code-switched than in unilingual English sentences ($b=0.624$, $SE=0.01$, $p<.0001$), in line with the predictions.

In Study 2, we use the highest and lowest cloze probability continuations from Study 1 as items in an ERP study (ongoing, currently GerEng $n=6$, SpaEng $n=10$). We test whether code-switching affects surprisal during processing. If code-switching biases towards less expected information, the N400 may be smaller for the less expected condition (“wine” in 1) and larger for the expected ending (“milk”).

Together, these studies could suggest that code-switching functions as a signaling cue for less expected information in early bilinguals, but not in late bilinguals, highlighting the potential role of bilingualism type and experience in shaping expectation-based language processing. Extensions to other language combinations and LLM simulations are underway.

References

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- [4] Kara D. Federmeier, Edward W. Wlotko, Estela De Ochoa-Dewald, and Marta Kutas. Multiple effects of sentential constraint on word processing. *Brain Research* 1146, 75–84, 2007.
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Examples and Figures

(1) Experimental conditions (critical continuation omitted)

(1a)_{English} Every morning he drank a glass of _____ (... , e.g., milk_{high} or wine_{low}).

(1b)_{German-English} Jeden Morgen he drank a glass of _____ (... , e.g., milk_{high} or wine_{low}).

(1c)_{Spanish-English} Cada mañana he drank a glass of _____ (... , e.g., milk_{high} or wine_{low}).

(Expected completion: milk; less expected alternative: wine)

Figure 1. Highest cloze probabilities for German-English code-switching vs. English-only

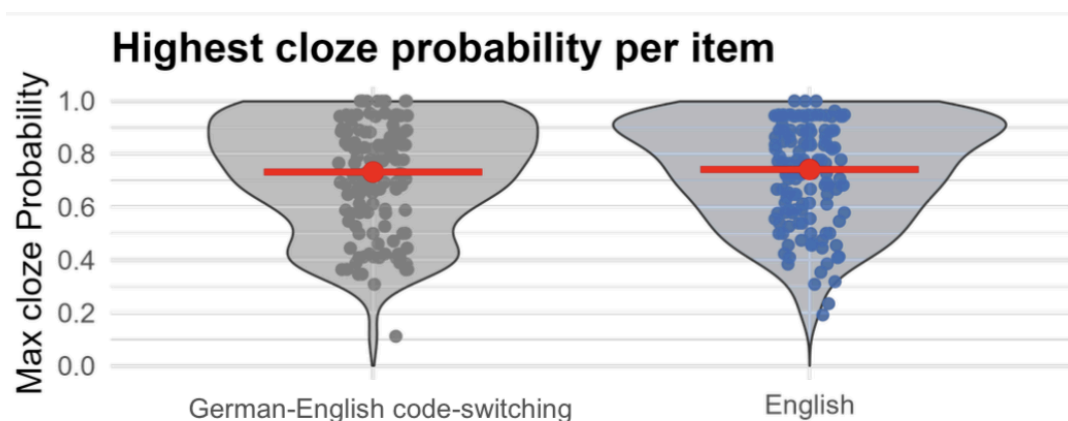


Figure 2. Highest cloze probabilities for Spanish-English code-switching vs. English-only

