

Domain general language control? An ERP study with bimodal bilinguals

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Language control is the process that restricts bilingual language production to the target language. One of the major discussions in the bilingual literature revolves around the extent to which language control is domain general. Some models assume that language control is entirely domain general, with language control and executive control both occurring mainly at the goal level (e.g., Meuter & Allport, 1999). However, other models of bilingual language production assume that language control is only partly domain general (e.g., Green, 1998), and still others assume that it is entirely language specific (e.g., Declerck et al., 2015). Since all models that rely on domain general language control have proposed that language control overlaps with more general cognitive control at the goal level, we decided to focus on this specific processing level. Hence, we used ERPs to investigate what happens during cue processing when participants activate the goal to produce a cued language in language switching or to perform a cued task in task switching.

Most studies investigating domain general language control have compared the processes involved in language switching, as an index of language control, with those involved in task switching, as an index of more general executive control. The results of behavioral and fMRI studies are not straightforward, with some showing similar switch cost patterns between language and task switching and others showing major differences.

In the ERP literature, the component linked to task rule activation is the switch-related posterior positivity. Cues that precede switch trials elicit a larger positivity across posterior electrodes relative to cues that precede repetition trials, with sometimes a reversed polarity across anterior sites (e.g., Lavric et al., 2008). The few studies that have investigated this component in language switching have reported finding the switch-related posterior positivity (e.g., Lavric et al., 2018) or have only found the switch-related anterior negativity (Verhoef et al., 2010), making it difficult to draw strong conclusions.

To further test whether language control is domain general, we conducted the first ERP study in which language and task switching were directly compared. Moreover, we examined an underrepresented group of bilinguals in the language control literature, namely bimodal bilinguals who have acquired both a spoken and a signed language. The only difference between the language and task switching paradigms was that in the language switching paradigm bimodal bilinguals switched between two languages (i.e., English and American Sign Language), whereas in the task switching paradigm they switched between two different tasks (i.e., color naming and category naming of colored pictures). Based on Lavric et al. (2018), we focused on cue-locked ERPs in the 300-700 ms time window.

We found a significant interaction between switching and anterior-posterior distribution, indicating that switch trials elicited a greater positivity over posterior sites and a greater negativity over anterior sites compared to repetition trials. This pattern replicates the bipolar distribution reported by Lavric et al. (2008) in a task switching paradigm and extends it to language switching. Crucially, no significant differences were observed between the language and task switching paradigms. Taken together, this study provides evidence that similar control processes occur for both language and cognitive control at the goal level (i.e., determining which language to produce or which task to perform).

References:

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