

INVESTIGATING COGNITIVE CONTROL IN LANGUAGE SWITCHING

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ABSTRACT

How do bi/multilinguals switch between languages so effectively that there is no obvious intrusion from the alternatives? One can examine this by comparing language selection with task selection, or language switching with task switching. This is the approach adopted in the first of two strands of research presented in this thesis.

In task switching, providing advance warning of the task typically leads to a reduction in the performance ‘switch cost’, suggesting top-down biasing of task selection. It is not clear whether the language switch cost also reduces with preparation, partly because there have been very few attempts to examine preparation for a language switch, and partly because these attempts suffered from non-trivial methodological drawbacks. In Experiments 1-3 I used an optimised picture naming paradigm in which language changed unpredictably and was specified by a language cue presented at different intervals before the picture.

Experiment 1, conducted on ‘unbalanced’ bilinguals, revealed some evidence of reduction in the language switch cost for naming times with preparation, but only when cue duration was short. In an attempt to further optimise the paradigm, in Experiment 2 the cue-stimulus interval (which was varied from trial to trial in Experiment 1), was varied over blocks instead. Visual cues were replaced with auditory cues – the latter also enabled a comparison between semantically transparent word cues (the spoken names of the languages) and less transparent cues (fragments of national anthems).

Experiment 2 revealed a reduction in switch cost with preparation for naming latencies, but only in the second language; the first language showed the reverse. To examine whether the increase in switch cost with preparation in the first language could be due to unbalanced bilinguals biasing processing towards L2, balanced bilinguals were tested in Experiment 3. This revealed a robust reduction in switch cost in naming latencies for both languages, which was driven primarily by the trials with the anthem cues. However, in the error rates the switch cost increased

with preparation interval, thus complicating the interpretation of the reduction observed for response times.

Experiment 4 investigated whether preparation for a language switch elicits the electrophysiological patterns commonly found during preparation for a task switch – a switch-induced positive polarity Event-Related Potential (ERP) with a posterior scalp distribution. Contrary to a recent report of the absence of the posterior positivity in language switching, it was clearly present in the present EEG data. As in task switching, the amplitude of the posterior positivity predicted performance.

The electrophysiological data suggest that preparation for a language switch and preparation for a task switch rely on highly overlapping control mechanisms. The behavioural data suggest that advance control can be effective in language switching, but perhaps not as effective as in task switching. Experiments 1-3 also examined the effect of stimulus associative history – whether the language used on the previous encounter with a given stimulus influenced performance on the current trial). Having previously named a given picture in the same language benefited overall performance, but did not do so more for switches than repeats. Thus, stimulus associative history does not seem to contribute to the language switch cost.

The second strand of my research asked whether bilinguals can set themselves independently for speech vs. comprehension. Previous research has examined the cost of switching the language in output tasks and in input tasks. But, it is not clear whether one can apply separate control settings for input and output selection. To investigate this, I used a paradigm that combined switching languages for speech production and comprehension. My reasoning was that, if there is cross-talk between the control settings for input vs. output, performance in one pathway should benefit if the language selected for the other pathway is the same relative to when it is different: a ‘language match effect’. Conversely, if there is no cross-talk, there should not be a language match effect.

In Experiment 5 bilinguals alternated predictably between naming numbers in their first and second language (in runs of 3 trials), whilst also having to semantically categorise spoken words

which occasionally (and unpredictably) replaced the numbers. The language of the categorisation ‘probes’ varied over blocks of ~17 naming runs, but was constant within a block. The results showed a clear match effect in the input task (categorisation), but not the output task (naming). To examine the potential role of proficiency, Experiment 6 used the same paradigm to test unbalanced and balanced bilinguals. The pattern of results was qualitatively similar in both groups to that observed in Experiment 5: a language match effect confined to the input task. These results suggest ‘leakage’ from the output control settings into the input control settings.

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