The electrophysiology of voluntary and cued language switching



Nora Kennis¹, Xiaochen Zheng¹, Angela de Bruin² & Vitória Piai^{1,3}

¹ Radboud University, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, The Netherlands ² Department of Psychology, University of York, York, UK ³Radboudumc, Donders Institute for Brain, Cognition and Behaviour, Department of Medical Psychology, Nijmegen, The Netherlands

INTRODUCTION

- We commonly investigate multilingual language control processes using cued picture naming paradigms. However, language switching in daily life can also occur freely when interlocutors share multiple languages, a process which is rarely studied using electrophysiology.
- Cued language switching tasks often show slower responses on switch trials than non-switch trials¹, a phenomenon known as the switching cost.
- Voluntary language switching could be behaviourally and electrophysiologically easier than cued switching, as less top-down control of the non-target \bullet language may be necessary when speakers are free to choose their language², but behavioural evidence is mixed ^{3,4,5}.
- This study investigates the electrophysiological switch effects in voluntary compared to cued language switching.

-MEIHODS — — — — — — — — — — — — — — — — — — —	
	TASK
PARADIGM	



25 Dutch-English late bilinguals performed two bilingual picture-naming tasks: switching between languages was cued in one and voluntary in the

- 240 trials per task.
- Stimuli from MultiPic database⁶
- Behavioural analysis using LMEM with 2*2 design
 - EEG analysis using cluster-based permutation

RESULTS



Each dot represents one participant. Black dots and lines represent overall mean per condition. There were significant effects of task and trial type as well as an interaction.



effect in the voluntary task. Dashed lines mark the time window of interest (180 to 300 ms). Topographies mark the difference between repeat and switch trials (computed as switch-repeat). There were no significant switching effects.



Time-resolved power of the switch effect (power in switch trials - repeat trials, normalised by their average). These graphs show the average over fifteen midfrontal channels. The permutation test showed no significant effects of task or trial type.

Stimulus-locked ERPs showing the task effect (left and middle) and topographical map showing the location of the cluster associated with the significant effect after Laplacian transform (right). Dashed lines indicate the time window of interest (180 to 300 ms). There was a significant effect of task, with a more extreme peak in the N2 time window in the cued than voluntary task. As can be seen on the right panel, the effect had a posterior bilateral source.

CONCLUSIONS -

- Behavioural results show a smaller voluntary than cued switching cost, meaning freely switching between languages seems to be easier than switching on cue.
- We found no EEG switch effects.
- Can neural switching costs be mapped onto behavioural switching costs at all? Effect sizes of neural switching effects may be altered by small design and population changes while behavioural effects remain robust.

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Correspondence email: norakennis@outlook.com



Radboud University Radboudumc Travel funding provided by the CNS travel grant