

## **How plastic is the adult brain for language processing? – ERP signatures of L2 acquisition and L1 attrition**

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Since the early 2000s, research on second language (L2) acquisition has been controversial as to how plastic the human brain is after puberty. Recent studies have extended this debate to first language (L1) loss: Does loss of brain plasticity during a critical period in childhood prevent late L2 learners from achieving native-like language proficiency while at the same time protecting them from losing their L1? My paper gives an overview of both these aspects, with a particular focus on L1 attrition. I will summarize some of the first large-scale event-related brain potential (ERP) studies on L1 attrition and discuss their implications for our understanding of the bilingual brain. First, I will present ERP data that extend attriters' own reports of lexical problems in their L1 and illustrate how similar words are confused as a function of language dominance and proficiency [1, 2]. Next, we will look at the highly controversial question of whether L1 morpho-syntax may be subject to attrition in adult migrants. One previous ERP study on grammatical gender failed to find clear ERP differences between German migrants and monolinguals and concluded that morpho-syntax in general may not be subject to L1 attrition effects [3]. However, ERP work from our own lab testing a range of grammatical structures in Italian immigrants in Montreal clearly shows that they processed Italian sentences differently than monolinguals, especially when English had become their dominant language [4-6]. Strikingly, L2-dominant attriters were found to perceive a grammatical sentence in their L1 as ungrammatical if it violated the L2 grammar [5]. As a whole, the available ERP data provide initial physiological evidence that L1 attrition in adult migrants' brains occurs at both lexical and morpho-syntactic levels of processing, modulated by the degree of exposure to the two languages. Together with other evidence from late L2 learners [7], the data suggest that the adult brain remains plastic for both L2 and L1. Where ERP data patterns seem inconsistent across studies from different labs, I will discuss potential underlying reasons [6, 8]. If time allows, the paper will also briefly touch upon how L1 attrition may positively influence one's L2, and how our interpretation of the terms 'attriter' and 'attrition' may impact future research in this area.

### **References**

- [1] Kasperian, K., & Steinhauer, K. (2016). Lexical-semantic processing of confusable words in first-language attrition and late second-language acquisition: An ERP study. *Neuropsychologia*, 93, 200–217. DOI: 10.1016/j.neuropsychologia.2016.10.007.

- [2] Kasparian, K., Postiglione, F., & Steinhauer, K. (under revision). In my other language: An ERP study of Italian-English cognates and homographs in L1-attrition and L2-acquisition. *PLoS-ONE*.
- [3] Bergmann, C., Meulman, N., Stowe, L.A., Sprenger, S.A., & Schmid, M.S. (2015). Prolonged L2 immersion engenders little change in morphosyntactic processing of bilingual natives. *NeuroReport*, 26, 1065-1070.
- [4] Kasparian, K., Vespignani, F., & Steinhauer, K. (2016). First-language attrition induces changes in online morphosyntactic processing and re-analysis: An ERP study of number agreement in complex Italian sentences. *Cognitive Science*, 1-44. DOI: 10.1111/cogs.12450
- [5] Kasparian, K. & Steinhauer, K. (2017). When the second language takes the lead: Neurocognitive processing changes in the first language of adult attriters. *Frontiers in Psychology*, 8, 389. DOI: 10.3389/fpsyg.2017.00389.
- [6] Steinhauer, K. & Kasparian, K. (forthcoming). EEG and ERP approaches to language attrition. In: *The Oxford Handbook of Language Attrition*. (eds. Monika Schmid and Barbara Köpke), Oxford University Press.
- [7] Steinhauer, K. (2014). Event-related potentials (ERPs) in second language research: A brief introduction to the technique, a selected review, and an invitation to reconsider critical periods in L2. *Applied Linguistics* 35 (4), 393-417
- [8] Kasparian, K. & Steinhauer, K. (2018). On missed opportunities and convenient “truths”. *Linguistic Approaches to Bilingualism*, 7 (6), 709-714. [Commentary on M.S. Schmid & B. Köpke: ‘The relevance of first language attrition on bilingual development’.]