

Investigating the neurocognitive correlates of L1 attrition: Changes in morphosyntactic processing

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Although research on multilingualism has revealed continued neuroplasticity for language-learning beyond what was previously expected¹, it remains controversial whether – and to what extent - L1 attrition may be observed in the morphosyntax of adults who have lived in an exclusively monolingual L1 context until adulthood. Moreover, it is an important but understudied question whether specific neurocognitive processes involved in language are susceptible to change^{2,3}, and how such processing differences may (or may not) be reflected in attriters' linguistic behavior.

Using event-related-potentials (ERPs), the real-time processing of Italian relative-clauses was examined in 24 Italian-English adult migrants whose predominant language had shifted from Italian to English and who unanimously reported experiencing attrition in Italian, compared to 30 non-attriting native-speakers in Italy (controls). Relative clauses allow us to test the processing of complex morphosyntax, as well as the possibility of changes in grammatical preferences and processing patterns due to cross-linguistic influence and L2 experience⁴. Both languages allow V-NP-subject (**a**) and NP-V-object (**d**) orders, whereas V-NP-object (**b**) and NP-V-subject (**c**) structures are ungrammatical in English. Moreover, it has been shown that Italian readers rely on semantic cues and subject-verb agreement for sentence interpretation, whereas English readers rely primarily on word-order⁵. Based on these cross-linguistic differences, we expected attriters to process those Italian sentence constructions that clash with English as ungrammatical, and not to benefit from cues such as number agreement or strong agent-patient relationships with semantically-biasing verbs (e.g., *policeman/arrest/thief*).

In their acceptability-judgment ratings (1-5) at the end of each sentence, attriters differed from non-attriting Italian speakers only on the two word-orders that are permissible in Italian but not in English, giving these sentences significantly lower ratings. The ERP results for the V-NP conditions (**b** vs. **a**) revealed *qualitative* group differences in processing strategies: while Italian native-controls elicited an N400 (processing semantic cues for interpretation) followed by a late P600 effect (850-1050ms), attriters did not show an N400 effect and elicited an earlier and more broadly-distributed P600 (650-850ms). Interestingly, the N400 effect in native-controls was larger in speakers who gave higher ratings to the V-NP-object sentences, compatible with the idea that native-Italians use semantic cues such as agent-patient likelihood to arrive at the interpretation of the sentence. In contrast, attriters seem to process these sentences as morphosyntactic violations, eliciting large P600s earlier than Controls, with larger P600 amplitudes associated with lower acceptability ratings, longer length of residence in the L2-environment and higher L2-English proficiency scores. The ERP results for the NP-V conditions (**c** vs. **d**) also revealed significant group differences: in response to NP-V-subject sentences, which are infrequent but grammatical in Italian, native-Controls elicited a frontal positivity (550-650 ms) followed by a late posterior P600 (900-1050), consistent with a garden-path effect⁶. Conversely, attriters elicited an early negativity (300-400ms) followed by a numerically larger frontal positivity, as well as a P600 with an earlier onset (650-900ms) and less posterior distribution than in native-Controls. Larger P600 amplitudes were associated with lower acceptability ratings in both groups. However, within the attriters, lower acceptability ratings and higher L2-English proficiency scores were associated with a larger early negativity.

These findings provide the first neurophysiological evidence of processing changes in adult attriters' morphosyntax, revealing not only quantitative but also qualitative differences in the underlying neurocognitive mechanisms. Attriters with limited L1-exposure/use and increasing L2 dominance are influenced by their English grammar although reading exclusively in Italian, and the extent of this influence within attriters is modulated by experiential factors.

- a. V-NP-Subject: Il poliziotto (S) che arresta i ladri (O) registra i nomi.
(The policeman (S) that arrests the thieves (O) registers the names.)
- b.* V-NP-Object: I ladri (O) che arresta il poliziotto (S) attendono in macchina.
(The thieves (O) that arrests the policeman (S) wait in the car.)
- c.* NP-V-Subject: Il poliziotto (S) che i ladri (O) arresta registra i nomi.
(The policeman (S) that the thieves (O) arrests registers the names.)
- d. NP-V Object: I ladri (O) che il poliziotto (S) arresta attendono in macchina.
(The thieves (O) that the policeman (S) arrests wait in the car.)

* Conditions that would be ungrammatical if translated into English

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