

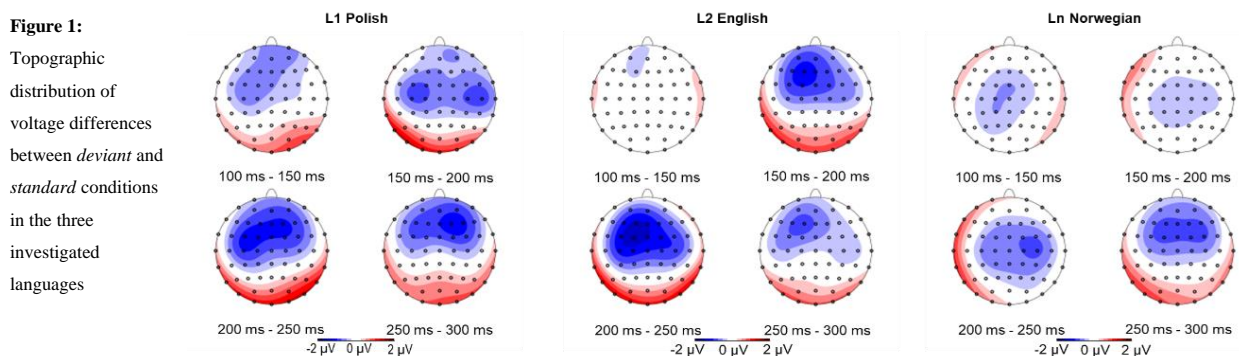
The neurophysiology of phonemic contrasts perception in multilingual speakers

With increasing global migration, bi- and multilingualism has become the norm rather than the exception. While the phenomenon undoubtedly comes with many advantages, it also involves numerous challenges: one of the key components of successful language learning is associated with the learner's ability to discriminate foreign sound contrasts. Several event-related brain potential (ERP) studies focused on pre-attentive phonemic perception and observed reduced discrimination mechanisms in the L2 when compared with the L1 (Jakoby, Goldstein & Faust, 2011; Liang & Chen, 2022; Song & Iverson, 2018). What remains unexplored is a wider picture on how multiple languages interact in the same speaker, with possible differences between the first foreign language (L2) and next one (L_n) largely neglected so far in neurophysiological research.

The aim of the current ERP study was to investigate phonemic perception mechanisms in multilingual participants, whose L1 was Polish, L2 was English, and L_n was Norwegian (22 right-handed participants, mean age = 22.4, 5 males). They were exposed to selected vowel contrasts in their L1, L2 and L_n presented within the oddball paradigm (i.e., a sequence of frequently occurring standard stimuli was interrupted by the occasional appearance of deviant stimuli). Apart from the EEG session, the participants also completed L2 and L_n proficiency tests, language history and use questionnaires as well as a gating task assessing their speech-specific aptitude. Data collection took place in the Neuroscience of Language Laboratory (Adam Mickiewicz University).

Given that Norwegian has a very large vowel repertoire (18 monophthongal vowels), English has a moderately large vowel repertoire (12), and Polish has a rather small vowel repertoire (6), the emphasis was placed on vowel contrasts. The following vowel pairs were used respectively as standards and deviants: /i/ and /ɛ/ for L1 Polish, /ɪ/ and /ʊ/ for L2 English and /i/ and /y/ for L_n Norwegian. Speech sounds were played via earphones while participants watched a silent movie. For all three languages, we observed the Mismatch Negativity (MMN) as a reaction to deviant stimuli, i.e., a negative-going wave deflection typically elicited by changes in auditory stimuli with a peak at around 150-250 milliseconds from change onset (Näätänen et al., 1997).

Based on previous studies, we hypothesized that the response to the change would be deficient for non-native languages when compared to L1, and this hypothesis was confirmed. However, we have additionally observed differences between L2 English and L_n Norwegian: for the former one, the MMN response had a delayed onset when compared with L1, and for the latter one, the response differed in terms of a lower amplitude (see Figure 1). Such findings clearly suggest that foreign language status as L2 or L_n modulates auditory language processing, which at the same time opens the discussion on the participants' language proficiency and dominance as factors influencing phonemic perception mechanisms.



References

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