

In search of the neural signature of a native and a second language. Using fMRI to investigate a relationship between a complexity of linguistic input and neural similarities and differences between the two languages.

The bilingual brain needs to be able to store and process not one but two different languages. Differences in neural processing of the native and second language have been observed by numerous studies; however, we still do not fully understand what they reflect exactly. First, are the differences between languages limited to the processing of single words? Or do they also affect how bilinguals process more complex utterances such as sentences or narratives? Second, is the neural correlate of each language related to the way it is represented in the brain i.e. how the brain stores information encoding meaning, words, or grammatical rules, or is the main difference in neural processing of the native and the second language related to engagement of language-external cognitive control? This project will zoom into the neural basis of native and second language processing and address these questions.

To characterize neural correlates of language processing in bilinguals on different levels of complexity, Polish-English bilinguals will be asked to read single words, sentences, and short narratives in their L1 or L2. At the same time, their brain activity will be tracked using a functional magnetic resonance. Using cutting-edge machine methods such as representational similarity analysis, multi-voxel pattern classification, and multi-layer classification, this project will identify the neural basis of (1) representational similarities and differences between the two languages as well as (2) processing costs associated with increased engagement of cognitive control in second language processing.

Drawing on recent methodological and analytical advances, this project will contribute novel evidence to the existing literature. First, it will deepen the understanding of differences between L1 and L2 beyond single word processing. Second, it will employ novel, cutting-edge machine learning methods to model neural activity. Recent developments in neural data analysis allow identification of precise neural populations engaged in language processing as well as modelling neural activity corresponding to more naturalistic language processing that goes beyond single word processing.

Altogether, the proposed research project will provide new insights into the neurolinguistics of bilingualism. Testing the extent of representational overlap between L1 and L2 in the same speakers will extend our understanding of how the bilingual mind organizes, stores, and processes two languages. Testing the neural basis of bilingual language on different levels of complexity will be an important contribution to the theoretical models of bilingual language processing.