Neuroimaging approach to processing lexical complexity in Polish

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Evidence from English suggests that different types of lexical complexity modulate the involvement of different fronto-temporal language networks during language comprehension (Marslen-Wilson & Tyler, 2007). Morpho-phonological complexity (regularly inflected verbs, *play-ed*) activates left-lateralised network encompassing inferior frontal areas. On the other hand, increased general processing complexity (words with onset-embedded stems, *clay-claim*) engages fronto-temporal areas bilaterally.

In this initial study we ask whether Polish, with its much richer inflectional system, can be shown to observe similar neuro-cognitive contrasts. To engage the bilateral subsystem we use words with embedded stems, as in English (e.g. *kot-kotlet* or *szal-szaleć*). To investigate specifically linguistic processing, we use three types of complexity, some specific to Polish:

1. Simple vs. case-inflected nouns, e.g. *dom / dom-u* (cf. *play/played*)
2. Verbs with varying numbers of stem alternations, e.g. *czytać / nieść*
3. Verbs with varying numbers of possible inflectional endings, e.g. *niosę / niósł*

We employ both behavioural (auditory lexical decision) and brain imaging (fMRI) methods to study these types of complexity.

Behaviourally, nouns showed differing latencies according to apparent complexity; with inflected nouns slowest and simple nouns fastest. Imaging data, in contrast to English, did not differentiate these noun conditions. For verbs we saw no effects of inflectional complexity in either imaging or lexical decision. Multiple stem forms, however, elicited lower latencies in lexical decision and were correlated with a reduction in neural activation in the left superior and middle temporal gyri, relative to verbs with fewer stem forms. This facilitation by multiple stem forms of the same verb may be analogous to the processing advantage for words with multiple senses (Rodd et al., 2002). We additionally contrasted stem-based complexity effects in production and comprehension of Polish, and suggest that differences reflect different task demands. In conclusion, lexical processing in morphologically complex languages like Polish may differ substantially from less complex languages like English.