The Neuroscience of Languages

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It is generally the case that behavioural, neuropsychological and imaging studies of language have been carried out in a single language (most often English); results are typically discussed as revealing properties of the language system as a whole. However, it is well known that the structure of typologically-different languages can differ dramatically, and that languages can differ in the modality they use (spoken vs signed). Some intriguing processing and neuroanatomical consequences of these differences have been already established. For example, there is some indication that sign language may rely on visuo-spatial cognition (and therefore on multi-modal integration parietal areas) to a greater extent than spoken languages; and that a tonal language such as Mandarin may recruit the right hemisphere to a greater extent than non-tonal languages such as English. It is only by carrying out cross-linguistic studies that we can gain insight into which aspects of language are best candidates to be universal, i.e. can be described by the same psychological mechanism and are subserved by the same neural substrate. Despite its potential to unravel the universal basis of language, cross-linguistic research has not been endorsed to a greater extent because of the logistical difficulties involved in finding native speakers and patient populations from the different language groups. This can be achieved via international collaborations, but these are expensive and effortful. These logistic problems are exacerbated if the studies involve state-of-the-art imaging. Crucially, the London area offers us the unique opportunity to successfully embark on cross-linguistic research that spans levels of linguistic analysis and aims at assessing the role of typological or modality differences in the neural substrate, both during language acquisition and during language processing in adulthood.

In such a project, language commonalities and differences need to be established in a laboratory setting, but corpus analyses are also vital. For instance, corpus analyses can provide us with indications (at a language-specific level) of which distributional cues can be used to perform linguistic tasks such as word segmentation or syntactic analysis. The role of these distributional cues - which are bound to differ cross-linguistically - and of their integration, can then be assessed in developmental, computational and imaging studies.

The development of a comprehensive investigation that covers different levels of linguistic analysis (from speech recognition to semantics), which is interdisciplinary and which simultaneously tackles the investigation of language functions in typologically different spoken and signed languages would certainly contribute to placing language research in the UK in a world-leader position, simply by virtue of building upon and capitalising on the existing expertise, the availability of relevant populations and, crucially, access to PET, fMRI, TMS, ERP and MEG. The Centre for Human Communication at UCL is a natural home for such a project because of the breadth of its expertise in different levels of linguistic analysis and because many of its members have already recognised the potential of a cross-linguistic and cross-disciplinary approach.