**Abstract**

In this lecture, I will share the results of three neuroimaging experiments on filler-gap constructions in Mandarin Chinese with the attempt to explore the neural foundations of filler-gap dependencies and the nature of different “empty categories (ECs)” in Chomsky’s Generative framework.

Experiment 1 compared Chinese topic constructions and relative clauses to see how the brain responded to gapped structures with different filler-gap orders (or movement directions). The result showed that both constructions elicited activities in the left inferior frontal gyrus (L-IFG) and the left superior/middle temporal gyrus (L-S/MTG). However, it also indicated that these two core regions, both playing a crucial role in movements, were insensitive to the movement direction. The gap-first structure, i.e., relative clauses, additionally triggered activation in the left anterior temporal lobe (L-aTL).

Experiment 2 compared topic and passive constructions in Chinese to see if the brain processed gaps contrastively in various gapped structures. The passive construction in Chinese was analyzed differently from the traditional view of A-movement, where the (covert) null operator movement was proposed for the long passives. In this study, however, we found that the brain activity pattern for passive constructions resembled that for topic constructions, where the co-activation of the L-IFG and the L-MTG did not support the covert movement and the non-movement (complementation) analyses. However, the similarities also failed to either postulate an NP-trace in the gap position or distinguish an NP-trace from a wh-trace (in the topic construction).

Experiment 3 investigated the neural bases of the two types of non-gapped ECs (pro and PRO) in embedded clauses selected by Chinese *hope*-verbs (with a pro) and *try*-verbs (with a PRO), respectively. The two ECs were argued to be distributed complementarily due to their syntactic properties. The results revealed that, while pro elicited the anterior portion of the L-IFG (pars orbitalis, POrb) and the L-MTG, the PRO elicited no significant brain regions, which was an unexpected finding. The distinct brain activation results also indicated the differences in brain activation and processing difficulties. The implication of the POrb may be accounted for by the fact that the construction with a pro did not involve movements, which required a filler to be stored with extra working memory.

Overall, it is argued that the primary function of the L-IFG is storing and retrieving necessary information (including the filler) for the gap, while the L-S/MTG is mainly responsible for filler/gap and verb/gap integration. The resembling results also leads to the main argument of this dissertation that, in addition to emptiness, the core characteristic of the empty categories is **dependency**. However, processing the dependency of ECs requires the collaboration of the L-IFG and the L-S/MTG, which also allows us to explain the processing of constructions involving other dependencies, including pronouns, reflexive binding, and subject-verb agreement.