Sample parsing of the sentence “The boy is stealing cookies” demonstrating some features of syntactic complexity such as width (in this case, the NP has a width of 3) and height (in this case, the VP has a height of 2)

**Factor 1** was strongly composed of mainly **syntactic** features and VLSM was thus controlled for **WAB fluency** (in decreasing order of loading scores: clause width, width/height and number of verbal phrases, number of words, speech rate, number of clauses and their height, distance between noun phrase and verb phrases, etc.).

**Factor 2** was strongly composed of mainly **lexical** features and VLSM was thus controlled for **WAB naming** (in decreasing order of loading scores: frequency of all words, number of nouns, adverbs, and adjectives, as well as verb, noun, and overall lexical variation).

**Conclusions**

We showed that syntactic performance beyond speech fluency might rely on the inferior frontal gyrus (Broca’s area), while lexical performance beyond fluency may depend on areas in the precentral and post-central gyri as well as the postero-superior tempororo and inferioparietal regions. Our findings show that NLP applied to connected speech elicited by patients with post-stroke aphasia can shed light on the organization of language in brains with vascular damage.