

Syntactic parsing reduced to its core

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Chomsky (2007) proposes that language is a system designed for thought and only subsidiarily connected to the perception. If so, this would suggest that the grammar and the perceptual systems are two different realities of the mind that may have to come to be connected serendipitously. The aim of the psycholinguist would then be to work out how the perceptual systems deal with producing and processing language, a labour for which they were plausibly not designed. An “analysis-by-synthesis” approach might be a sensible way to relate grammar and perception, as it accommodates the fact that language comprehension is primarily a perceptual phenomenon (by postulating a first stage in which a ‘preliminary analysis’ is undertaken) with the observation that the representations the parser builds are structured, and hence generatively constructed (by grammatical rules stored in memory). Townsend & Bever (2001) suggest that the preliminary analysis involves imposing a NVN template onto the input, which we reformulate here as a (Specifier)-Head-Complement(s) (SHC) one in order to probe the cognitive load of complex Ns (SHCs embedded into other SHCs). We used the click-detection paradigm, an online technique that has been shown to be sensitive to the different memory loads between and within-clauses in complex sentences. 60 pairs of mono-clausal Spanish sentences composed of high frequency words and 20-syllables long were employed. These pairs were constructed from subject-verb-object sentences, resulting in two experimental conditions: extension of the verb to the left or to the right (Type A or Type B). Three click positions (1-2-3) were controlled for length and every sentence had one click only. Subjects listened to 72 sentences (12 practice, 60 experimental) and were instructed to press a button as soon as they heard the superimposed, 1000Hz tone, which had a peak amplitude similar to the most intense sound of the materials and a length of 25 ms. Responses were longer at the beginning of sentences, and there was a linear decrease in RTs between positions within sentence type. An analysis of variance showed that the Position factor was significant for both subjects and items analyses ($p < .01$), while the Type factor was only significant for the subjects analysis ($p < .05$; $p = .120$ for items). There was no interaction effect between factors in either analysis ($p = .534$, $p = .860$). Nevertheless, we compared pairs within same sentence type (A1 vs. A2, etc.) and across sentence type (A1 vs. B1, etc.) with a two-tailed t-test and found that all comparisons within sentence type were statistically significant for subjects and items, while the A2-B2 pair proved to be significant in the subjects analysis ($p < .05$). The data point to an uncertainty factor (similar to other monitoring tasks), a position effect, and to a lesser degree, a “verb search” effect. The latter two have not been reported in the literature, but may be taken to suggest that at a very early stage of processing the parser is (a) sensitive to the macro SHC structure and (b) trying to conjoin phrases as soon as possible (i.e., there is no “wrap-up” effect).

Materials

Experimental items (the click positions are marked by the | symbol):

Type A: La apertura | del hospital | se demoró | por diversos motivos.
‘The opening of the hospital was delayed for various reasons’

Type B: La apertura | se demoró | por motivos | aún desconocidos.
‘The opening was delayed for as yet unknown reasons’

Results: Subjects analysis, N=80: A1=257.22 ms; A2=222.51; A3=206.78
B1=252.40; B2=217.33; B3=205.26

Items analysis, N=60: A1=257.04; A2=222.78; A3=207.05
B1=253.23; B2=217.32; B3=205.00

References

- Chomsky, N. (2007). Biolinguistic explorations: Design, development, evolution. *International Journal of Philosophical Studies*, 15(1), 1–21.
- Townsend, D., & Bever, T. (2001). *Sentence comprehension: The integration of habits and rules*. Cambridge MA: The MIT Press.