The Complex Case of Weak Islands

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VILLATA, Sandra, FRANCK, Julie. The Complex Case of Weak Islands. Bollettino della Società di linguistica italiana, 2015, no. 33, p. 141-143
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According to Feature Relativized Minimality (fRM; e.g., Friedmann et al. 2009), the degradation of sentences involving intervention is a function of the features’ similarity between the extractee and the intervener: ill-formedness is predicted to be stronger when all features match (identity) than when features partially match (inclusion). Moreover, only morphosyntactic features triggering movement are supposed to be relevant for the calculation of the similarity (narrow similarity). The alternative hypothesis consists in maintaining that features inducing similarity extend outside the boundary of syntax, including semantic and pragmatic features (broad similarity). This approach is defended by processing-based accounts as the Cue-based model to memory retrieval (CB; see Gordon et al. 2002, Van Dyke and Lewis 2003, McElree et al. 2003), according to which the retrieval operation carried by the verb is driven by both semantic and syntactic cues.

A way to adjudicate between these approaches consists in testing the role of semantic features in modulating similarity-based interference effects: if features other than morphosyntactic features triggering movement modulate similarity, this would shift the balance towards a broader approach to similarity.

Experiment 1 manipulated the lexical restriction on both wh-elements (Bare vs. Restricted) and the Animacy of the extracted wh-element (Animate vs. Inanimate) given an animate intervener, as in (1):

(1) a./b. Who/What do you wonder who appreciated?
    c./d. Which professor/Which class do you wonder which student appreciated?

Forty-two participants were asked to judge 32 items of the kind of (1) on a 7-points Likert scale. Results from mixed-model analyses attested to an effect of Lexical restriction \((p<.001)\), with higher scores for restricted than bare wh-elements. No main effect of Animacy was found. Nevertheless, a significant interaction between Lexical restriction and Animacy \((p=.003)\) revealed an effect of Animacy for restricted wh-elements only, attesting to higher rates when the extractee is inanimate than when it is animate. However, thematic roles are always reversible in sentences matching in animacy, possibly increasing the computational complexity.

Experiment 2 investigates if reversibility of thematic roles is an additional factor of complexity by manipulating the Specificity of the Verb with respect to its arguments (Specific vs. Non-specific) for both restricted and bare wh-elements. Specific verbs should block reversibility, as illustrated in (2):

(2) a./b. Who do you wonder who saw/rejected?
    c./d. Which student do you wonder which professor saw/fired?

Forty-two participants were asked to judge 32 items on a 7-points Likert scale. Results revealed a significant main effect of Lexical Restriction \((p<.001)\), with higher rates for restricted
than bare wh-elements, and a significant effect of Verb Specificity (p=.004), with higher scores for specific than non-specific verbs. Finally, a significant interaction between Lexical Restriction and Verb Specificity (p=.037) attested to an effect of Verb Specificity for restricted wh-elements only, suggesting that reversibility of thematic roles is in fact a source of complexity.

Results from Experiments 1 and 2 show that features other than morphosyntactic ones triggering movement modulate similarity. However, the on-line time-course of the interplay of syntactic and semantic information still remains unexplored.

Experiment 3 employed a speed-accuracy trade-off (SAT) procedure in order to track response accuracy across the full time-course of retrieval. Eighteen French participants were trained to express their acceptability judgments in correspondence to 18 tones presented at 250ms intervals following onset of the last phrase. Thirty-six sets of conditions like (3)-(6) were generated:

(3) Bare Identity: What do you wonder who built?
(4) Complex Identity: Which building do you wonder which engineer built?
(5) Inclusion: Which building do you wonder who built?
(6) Inverse Inclusion: What do you wonder which engineer built?

Distribution of accuracy (d’) as a function of retrieval time takes the form of an exponential curve, increasing from chance level up to asymptotic level reached when additional time does not modify response choices anymore. The speed of the curve’s growth from chance to asymptotic level provides a measure of the time needed to complete the wh-dependency, while the asymptote indexes ultimate acceptability.

Asymptotic performance revealed a significant effect of the lexical restriction on the extractee (t=4.3) and on the intervener (t=2.02), attesting to higher acceptability for restricted wh-elements than bare ones. No significant differences in the dynamics were found. Moreover, the fact that retrieval dynamics of sentences with semantically richer wh-elements is not slower than that of sentences with bare wh-elements suggests that semantic is retrieved within the same time window as syntactic information.

All in all, these results suggest that features inducing similarity extend beyond the boundary of syntax, giving support to a broad approach of similarity. However, wh-islands remain poorly accepted (never exceeding 4 points over 7), even in the presence of semantic cues. This becomes even clearer when comparing acceptability scores for islands (e.g., (3)-(6)) and non-islands (e.g., What/Which problem do you believe that he/the student solved?) (Fig.3). The huge improvement observed for non-islands with respect to islands suggests that while grammatical constraints posited by fRM define the boundary of grammaticality, semantic factors only participate in finely modulating acceptability within the boundaries posited by fRM. We argue that these results pave the way for a framework integrating grammar and processing constraints.