Semantic attraction in sentence processing

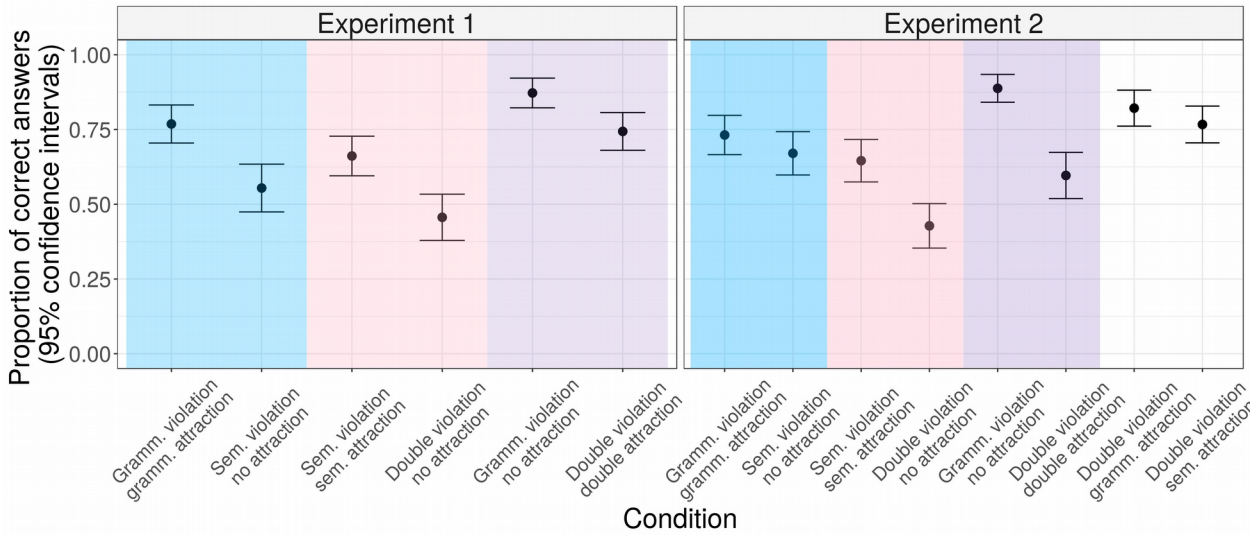
Anna Laurinavichyute (Higher School of Economics, Moscow; University of Potsdam),
Titus von der Malsburg (University of Potsdam)
anna.laurinavichyute@uni-potsdam.de

Cunnings and Sturt (CUNY 2017)[1] demonstrated that the processing difficulty triggered by implausible subject-verb combinations is alleviated in the presence of a distracting noun. For instance, sentences such as “Sue remembered the letter that the butler with the cup accidentally shattered” were easier to process than sentences where cup (shatterable) was replaced with tie (non-shatterable). Superficially, this effect bears similarity to agreement attraction effects where a verb with incorrect number marking elicits less processing difficulty in the presence of a non-subject noun whose number marking matches the verb’s.[2] This similarity is surprising given that agreement attraction is often assumed to be caused by derailed morphosyntactic processing, e.g. illicit percolation of an attractor’s plural feature to the head.[3] If we find similar effects in other domains, this would suggest that the mechanisms underlying agreement attraction are of a more general nature than previously believed.

To investigate semantic attraction effects, we employed an experimental paradigm that has previously been used to study agreement attraction in sentence production. We conducted two single-trial online experiments in order to avoid adaptation to the stimuli and strategic effects. In both experiments, participants were asked to memorize a verb presented in capitals (see Table 1), press the button to see a sentence fragment, and to decide whether the verb is a possible continuation of that fragment. We tested twenty five item sets in which the verb could match or mismatch the subject's grammatical number and/or meaning. Also, the verb could match or mismatch the attractor in number and/or meaning. In Experiment 1 (N=1072), we tested classic agreement attraction (more judgment errors in the presence of a number-matching attractor, b vs. a), the semantic analog to that (more errors in the presence of a semantically matching attractor, d vs. c), and double attraction (errors due to an attractor matching the verb's number and semantics, f vs. e). The purpose of the last contrast was to test whether and how agreement and semantic attraction interact. In Experiment 2 (N=1426), we added conditions g and h as additional baselines for the evaluation of this interaction.

In Experiment 1 (see Fig. 1), we replicated the classic agreement attraction effect (b vs a, $\beta=0.89$, $p=0.049$). In addition, we found a similarly large effect of semantic attraction (d vs s, $\beta=2.24$, $p<0.001$). Double attraction had a smaller effect (f vs e, $\beta=1.06$, $p=0.01$) than the sum of the two previous effects, potentially due to the easier-to-spot double violation (hence g and h as alternative baselines). In Experiment 2, the semantic ($\beta=1.99$, $p=0.002$), but not the agreement attraction effect was replicated. The effect size of double attraction was as big as the sum of the semantic and grammatical attraction effects in single violation cases. Finally, we compared the double attraction effect (f vs e) to the single attraction effects in sentences with double violations (g vs e, h vs e). Again, semantic but not grammatical attraction reached significance ($\beta=1.29$, $p=0.02$), and the magnitude of these two effects did not differ from that of double attraction.

To summarize, we demonstrated: 1) a semantic attraction effect in sentences in which the morphosyntactic agreement between the subject and the verb was intact, and 2) that the semantic attraction effect does not significantly differ from the morphosyntactic attraction effect in size (if anything, it tends to be bigger). Whether semantic and morphosyntactic attraction effects are additive could not be determined with sufficient certainty. Based on these results, we tentatively conclude that semantic and grammatical attraction effects are the results of a similar or even the same underlying mechanisms. These findings are compatible with memory retrieval accounts of language processing that assume that all possible features — morphosyntactic and semantic alike — are evaluated concurrently and have similar weights.[4] In contrast, models designed specifically to explain morphosyntactic agreement attraction may have a too narrow focus.



Verb	Sentence fragment	Violation	Attraction
HISS	a. The radio by the desk	grammatical	none
HISS	b. The radio by the desks	grammatical	grammatical
SHINES	c. The radio by the desk	semantic	none
SHINES	d. The radio by the lamp	semantic	semantic
SHINE	e. The radio by the desk	double	none
SHINE	f. The radio by the lamps	double	double
SHINE	g. The radio by the desks	double	grammatical
SHINE	h. The radio by the lamp	double	semantic

[1] Cunnings, I., Sturt, P. (2017) Retrieval interference and sentence interpretation. A talk presented at the CUNY 2017. **[2]** Wagers, M. W., Lau, E. F., & Phillips, C. (2009). Agreement attraction in comprehension: Representations and processes. JML, 61(2), 206–237. **[3]** Eberhard, K. M., Cutting, J. C., & Bock, K. (2005). Making syntax of sense: number agreement in sentence production. Psychol Rev, 1*12*(3), 531. **[4]** Lewis, R. L., & Vasishth, S. (2005). An activation-based model of sentence processing as skilled memory retrieval. Cogn Sci, *29*(3), 375-419.