

Number agreement attraction in Czech: A self-paced reading study

Jan Chromý (Charles University) & Radim Lacina (University of Potsdam)

jan.chromy@ff.cuni.cz

Background: Agreement attraction belongs to highly examined sentence processing phenomena (Jäger, Engelmann, & Vasishth, 2017). It has been claimed that processing of ungrammatical sentences such as *The key to the cabinets were rusty* exhibit a facilitatory interference effect: the presence of the plural marked attractor (*cabinets*) speeds up processing of the auxiliary (*were*) (e.g. Wagers, Lau, & Phillips, 2009, for English; Lago et al., 2015, for Spanish; Avetisyan, Lago, & Vasishth, 2020, for Armenian; Slioussar, 2018, for Russian).

It has been proposed that the facilitatory interference effect can be explained by cue-based memory mechanisms during comprehension (Vasishth, Nicenboim, Engelmann, & Burchert, 2019), which ought not to be language specific. Therefore, we predicted that the facilitatory interference effect would be also found in comprehending Czech sentences. Additionally, we also tested whether the animacy of the attractor plays a role in facilitatory interference. We hypothesized a greater facilitation effect for animate attractors due to animate nouns being more statistically likely to be subjects compared to inanimate ones (Dahl, 2000).

Methods: We ran two experiments in one with native Czech speakers (N=125) using word-by-word self-paced reading on the IbxFarm platform. The experiment contained 48 items (24 each) and we used 96 filler items (all grammatical). Each participant thus read 144 sentences. Each sentence was followed by a yes-no comprehension question. The experiments differed in the animacy of the attractor – Exp1 used animate attractor nouns, Exp2 inanimate attractors (see Item examples). Both experiments employed sentences with singular subjects and manipulated attractor number and verb number. Sentences were either grammatical with the future tense auxiliary in the singular or ungrammatical with the auxiliary in the plural. The order of items was randomized for each participant and the item conditions were counterbalanced using a Latin-square design.

Results: The results were analyzed using linear mixed models with sum coded attractor number and sum coded verb number as fixed effects and participant and item as random effects. In Exp1, we found a significant attractor number effect on the attractor+1 region ($\beta = 0.626$, $SE = 0.257$, $t = 2.432$, $p < 0.05$) and significant verb number (i.e. grammaticality) effects on the verb+1 ($\beta = 1.783$, $SE = 0.245$, $t = 7.282$, $p < 0.001$), verb+2 ($\beta = 1.006$, $SE = 0.222$, $t = 4.538$, $p < 0.001$) and verb+3 ($\beta = 0.575$, $SE = 0.262$, $t = 2.191$, $p < 0.05$) regions. Importantly, no interaction effect has been found. In Exp2, we found a significant attractor number effect on attractor+1 region ($\beta = 2.195$, $SE = 0.291$, $t = 7.544$, $p < 0.001$) and verb region ($\beta = 1.135$, $SE = 0.244$, $t = 4.645$, $p < 0.001$), significant verb number (i.e. grammaticality) effects on verb+1 ($\beta = 1.626$, $SE = 0.266$, $t = 6.113$, $p < 0.001$), and verb+2 ($\beta = 0.817$, $SE = 0.321$, $t = 2.549$, $p < 0.05$) regions, and an interaction effect on verb region ($\beta = 1.174$, $SE = 0.489$, $t = 2.403$, $p < 0.05$). Importantly, this effect was in opposite direction than initially hypothesized (RTs in the plural attraction condition were in fact higher than in the other ungrammatical condition, i.e. singular attractor + plural verb).

Discussion: Our results are not in line with previous research on agreement attraction in English and other languages, since we saw none of the predicted interaction patterns in either inanimate or animate nouns. While there was an effect of grammaticality, the predicted facilitatory interference was not observed in animate nouns. In items with inanimate attractors on the other hand, a significant interaction between grammaticality and attractor number was observed on the attractor already and then on the auxiliary. However, this effect was in the opposite direction than predicted—reading times were slowed down in these regions, creating an inhibitory effect.

In conclusion, the current study found no evidence of facilitatory interference effects in Czech and thus casts doubt on the cross-linguistic generalizability of this effect. One potential explanation for the lack of an observed effect is that our attractors were not in syncretic cases with the nominative. As Slioussar (2018) points out on the example of Russian, morphologically rich languages may require case syncretism as a necessary condition for facilitatory interference to occur.

Item examples

Exp1 (animate attractors)

(1) atractor-sg + verb-sg

Pohled | od | kamaráda | určitě | bude | probouzet | krásné | vzpomínky.
postcard-SG | from | friend-SG | surely | will-SG | evoke | nice | memories

(2) atractor-pl + verb-sg

Pohled | od | kamarádů | určitě | bude | probouzet | krásné | vzpomínky.
postcard-SG | from | friend-PL | surely | will-SG | evoke | nice | memories

(3) atractor-sg + verb-pl

* Pohled | od | kamaráda | určitě | budou | probouzet | krásné | vzpomínky.
postcard-SG | from | friend-SG | surely | will-PL | evoke | nice | memories

(4) atractor-pl + verb-pl

* Pohled | od | kamarádů | určitě | budou | probouzet | krásné | vzpomínky.
postcard-SG | from | friend-PL | surely | will-PL | evoke | nice | memories

'A postcard from a friend / friends surely will evoke nice memories.'

Exp2 (inanimate attractors)

(1) atractor-sg + verb-sg

Regál | v | obchodě | nepochybně | bude | pevně | ukotven | montérem | pochybné | kvality.
rack-SG | in | shop-SG | undoubtedly | will be-SG | firmly | anchored-SG | by a mechanic | of
questionable | quality

(2) atractor-pl + verb-sg

Regál | v | obchodech | nepochybně | bude | pevně | ukotven | montérem | pochybné | kvality.
rack-SG | in | shop-PL | undoubtedly | will be-SG | firmly | anchored-SG | by a mechanic | of
questionable | quality

(3) atractor-sg + verb-pl

* Regál | v | obchodě | nepochybně | budou | pevně | ukotveny | montérem | pochybné |
kvality.

rack-SG | in | shop-SG | undoubtedly | will be-PL | firmly | anchored-PL | by a mechanic | of
questionable | quality

(4) atractor-pl + verb-pl

* Regál | v | obchodech | nepochybně | budou | pevně | ukotveny | montérem | pochybné |
kvality.

rack-SG | in | shop-PL | undoubtedly | will be-PL | firmly | anchored-PL | by a mechanic | of
questionable | quality

'A rack in a shop / in shops will be undoubtedly firmly anchored by a mechanic of a
questionable quality.'

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