

More equal than others: processing asymmetries between different feature values

Natalia Slioussar (slioussar@gmail.com), Daria Antropova

HSE University

Numerous studies, formal and functional, focus on the problem of feature markedness: if we take some grammatical feature in a given language, e.g. number, which values are marked, which processes in the grammar does this markedness affect, does it always correlate e.g. with frequency?.. These debates are also reflected in psycholinguistics: which asymmetries do we find in processing? We report an interesting pattern found in agreement processing in Russian (based on one experiment and a reanalysis of earlier studies).

Many experiments that found relevant asymmetries studied agreement attraction. Agreement errors are produced more often and missed more easily in the presence of an *attractor* noun: e.g. in (1a) as opposed to (1b). But in many languages [1-3] including Russian [4], the effect was found only with plural (1a), not with singular attractors (1c). Asymmetries were also found for gender, but the patterns were more complex and less stable (for Russian, see [5, 6]).

In the present study, we looked at agreement without attraction. We reanalyzed data from two self-paced reading experiments focusing on the differences between case, number and gender in attributive (Exp.1, N=91) and predicative (Exp.2, N=68) agreement. They used stimulus sentences like (2) and (3a-b), respectively. Instead of comparing whether the readers react differently to errors in different features, we explored whether they react differently to errors after Sg or Pl, M or F, Acc or Loc controllers. Mixed-effects linear regressions models were used. Surprisingly, we found no differences for number, but significant differences for gender and case (see Fig. 1-2 for Exp. 2 as an example).

Since Exp.1-2 included only pairs of feature values, we could not tell if these asymmetries were due to the controller or the target. We ran another self-paced reading Exp.3 (N=96) focusing on gender with stimuli like (4a-c). It showed that *any* gender agreement errors are more salient after M than after F/N controllers. M is the most frequent gender (see the supplement for details). Taking this into account and relying on other case processing studies [7-8], we can conclude that *any* case errors are more salient after controllers in Gen and Acc, the most frequent cases. The fact that readers do not react differently to number errors after Sg and Pl controllers *outside* of agreement attraction is also supported by previous studies (e.g. [4]).

This is surprising: in agreement attraction studies, the differences between Sg and Pl were much more pronounced than gender effects! If our results are due to feature markedness or frequency, they would have manifested themselves for number as well. We suggest the following hypothesis. Number is semantically loaded for the absolute majority of nouns, while gender and case are not. Thus, all number errors produce equally pronounced delays, while for semantically opaque features, more subtle grammatical differences become apparent.

Examples

- (1) a. *The key to the cabinets were rusty.
b. *The key (to the cabinet) were rusty.
c. *The keys to the cabinet is rusty.

(2) **Exp.1: attr. agreement, controllers/targets: M/F gender, Acc/Loc case, Sg number**

*Učenyj natknulsja na stat'ju, soderžavšuju / *-všie / *-všij / *-všej interesnye fakty.*

Scientist stumbled upon paper_{F.ACC.SG} containing_{F.ACC.SG / *(F).ACC.PL / *M.ACC.SG / *F.Loc.SG} interesting facts

'The scientist stumbled upon a paper containing interesting facts.'

(3) **Exp. 2: predicative agreement, controllers/targets: M/F gender, Sg/Pl number**

- a. *Plakat visel / *viseli / *visela nad rabočim stolom.*

Poster_{M.SG} hung_{M.SG / *(M).PL / *F.SG} above working desk

- b. *Plakaty viseli / *visel / *visela nad rabočim stolom.*

Posters_{M.PL} hung_{(M).PL / *M.SG / *F.SG} above working desk

'A poster / posters hung above the working desk.'

(4) **Exp. 3: predicative agreement, controllers/targets: M/F/N gender, Sg number**

- a. *Nožik byl ubran / *byla ubrana / *bylo ubrano v special'nyj futljar.*

knife_{M.NOM.SG} was_{M.SG / *F.SG / *N.SG} put-away_{M.SG / *F.SG / *N.SG} in special case

- b. *Ščetka byla ubrana / *byl ubran / *bylo ubrano v special'nyj futljar.*

brush_{F.NOM.SG} was_{F.SG / *M.SG / *N.SG} put-away_{F.SG / *M.SG / *N.SG} in special case

- c. *Šilo bylo ubrano / *byl ubran / *byla ubrana v special'nyj futljar.*

pricker_{N.NOM.SG} was_{N.SG / *M.SG / *F.SG} put-away_{N.SG / *M.SG / *F.SG} in special case

'The knife / brush / pricker was put away in a special case.'

Figures and Tables

Fig. 1. Exp.2: Average reading times (in ms) per region in different conditions depending on the gender of the controller

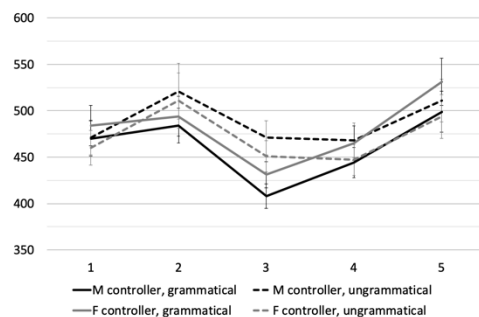
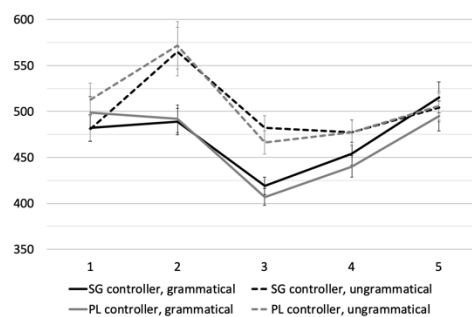


Fig. 2. Exp.2: Average reading times (in ms) per region in different conditions depending on the number of the controller



References

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A brief overview of agreement in Russian

In Russian, adjectives and participles agree with nouns in gender (only in singular), number, and case. The number feature has two values (Sg, Pl), the gender feature has three values (M, F, N) and the case feature has six values (Nom, Gen, Dat, Acc, Ins, Loc). Verbs agree with subject noun phrases in number and person in non-past tenses or in number and gender (only in singular) in the past tense. Masculine forms have null endings.

Gender markedness in Russian is a matter of debate. M is the most frequent gender in Russian, and many typological and OT models treat it as unmarked. N is the least frequent gender, but it is used in impersonal sentences. Many formal models assume that it is unmarked. Psycholinguistic studies contribute to this debate showing that M behaves as unmarked in processing (and the data discussed in the present paper are consistent with this pattern), while N behaves as unmarked in production (see [5,6]).