Different ways to encode information structure and how they interact: a production and comprehension study on the Russian language

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Background. Russian is widely recognized as a language with significant flexibility in word order, often linked to information structure (IS). However, Russian also allows for IS-related sentential stress shift from its neutral final position (see (1a-c)). The extensive research on word order variations in Russian (e.g. [1]; [3]) contrasts with the relatively limited exploration of stress shifts. The interplay between these two IS-related phenomena is especially obscure, both within Russian and in a cross-linguistic perspective. Furthermore, studies focusing on these two phenomena in production and comprehension (e.g. [2]) and especially comparing them are still scarce.

We address this gap by presenting findings from three experiments. In **Experiment 1**, participants (N=30) were given written texts with blanks where target sentences and fillers were replaced by randomized word lists in parentheses. They were asked to produce sentences using these words (always S, V and O in target sentences; see (2)) and read the text aloud, allowing us to analyze their choices in word order and prosody under varying IS conditions. In narrow focus conditions, target sentences answered *wh*-questions, as in (2), or corrected information from the preceding sentence (e.g. 'Did Masha eat soup? – No, Masha ate porridge.').

The results are in Table 1 (excluding singular answers). Here and below, we used mixed-effects logistic and ordinal regressions to analyze the data (in Exp. 1, only sentences with narrow foci were analyzed statistically). Firstly, answers with stress shifts were more numerous than those with word order alternations, especially in corrective focus conditions, while the previous studies of Russian gave little attention to stress shifts. We hypothesize that this could be due to the use of dialogues as contexts and plan to check this in a further study. Secondly, we received many answers with fronted foci, previously regarded as marginal in Russian. Again, this could be due to the use of dialogues, in which one wants to convey new information as soon as possible, while establishing coherence is easy and thus is not a priority. Both focus position (S/O/V), focus type (wh/corr) and their interaction were significant for the distribution of answers. E.g. subject foci are sentence-final more often than verb foci — no distinctions between different constituents in this respect have been previously discussed, and no existing IS models can readily explain them.

In **Experiment 2**, we used certain target sentences produced in Exp. 1 (see Table 2) and asked participants (N=30) to come up with felicitous questions for them. Two factors were used in the statistical analysis: whether the word order is canonical and whether the stress is neutral. The percentage of correct answers was very high in all conditions, which shows that the participants can effectively perceive and interpret different means of IS encoding. Still, both the word order and the stress factors, as well as their interaction, significantly affected the number of correct answers. Thus, changing the word order or the stress position, and especially both to front the focus does have a cost for interpretation. Such comparisons have never been done before.

In **Experiment 3**, we paired target sentences with the canonical SVO order and questions to them produced in Exp. 1 (see Table 3) so that some answers matched the questions and the others did not. Participants (N=30) were asked to rate the naturalness of these pairs on a 1 to 5 scale. The results are summarized in Table 4. Firstly, matching pairs were rated significantly higher than non-matching ones, especially in case of corrective foci (potentially, due to enhanced prosody). This confirms some results of Exp. 3 using a different method: participants effectively process IS-related stress shifts. Moreover, we showed for the first time that it matters where the stress was shifted, if it is in a wrong place.

In total, the interaction of syntactic and prosodic IS-related phenomena in Russian is shaped by several forces. It is preferable to have the focused constituent either (i) at the end, to enhance coherence, or (ii) at the beginning, to be more efficient in production. At the same time, there are economy constraints: if possible, do not change (iii) the canonical word order and (iv) the neutral

stress position. Violating these constraints and opting for (ii) rather than (i) has a small, but detectable cost for the comprehender.

References. [1] Slioussar, N. (2007). Grammar and information structure: A study with reference to Russian. Utrecht: LOT Publications. [2] Takahashi, C., Kao, S., Baek, H., Yeung, A. H., Hwang, J., & Broselow, E. (2018). Native and non-native speaker processing and production of Contrastive Focus Prosody. *Proceedings of the Linguistic Society of America*, *3*, art. 35. [3] Titov, E. (2020). Optionality of movement. *Syntax*, *23*, 347–374.

(1) a. *Kto priglasil Lenu?*
'Who invited Lena?'
b. *Lenu priglasil VANJA.*
Lena.$_{ACC}$ invite.$_{PST.3SG.M}$ Vanja
'Vanja invited Lena.'
c. *VANJA priglasil Lenu.*

(2) … *V bol'nice medsestra sprosila u doktora:*
'At the hospital, the nurse asked the doctor:'
— *Čto s'ela Maša?*
'What did Masha eat?' (*wh*-question to the object)
— _____ *(s'est', kaša, Maša).*
(to eat, porridge, Masha). (target sent.)

Table 1. The results of Exp. 1.

Focus	Type	Order&stress	Answers	
S	wh	**S**VO	53	(59%)
		OV**S**	36	(40%)
	corr	**S**VO	41	(68%)
		OV**S**	19	(32%)
O	wh	SV**O**	72	(80%)
		OVS	10	(11%)
		OSV	7	(8%)
	corr	SV**O**	60	(100%)
V	wh	S**V**O	56	(62%)
		VOS	8	(9%)
		VSO	11	(12%)
		SO**V**	13	(14%)
	corr	S**V**O	59	(98%)
whole sent.	wh	SV**O**	113	(94%)
		SO**V**	6	(5%)

Table 2. The results of Exp. 2.

Stimuli	Question focusing…	Answers	% correct
SVO (subject focus, neutral order, non-neutral stress)	S	106	
	V+O	5	88%
	O	9	
OV**S** (subject focus, non-neutral order, non-neutral stress)	S	106	
	S+V	1	89%
	O	13	
SV**O** (object focus, neutral order, neutral stress)	O	110	
	V+O	7	98%
	S	3	
OVS (object focus, non-neutral order, non-neutral stress)	O	97	
	V+O	4	84%
	S	19	

Table 3. Exp. 3: design.

Question focusing…	Stress in the SVO answer (lists 1 / 2)
O	O / V
	S / O
	O / S
	V / O
S	S / V
	O / S
	S / O
	V / S
V	V / S
	O / V
	V / O
	S / V

Table 4. The results of Exp. 3.

Question focusing…	Question type	Stress in the answer	Average rating
S	wh	S	4.3
		V	2.1
		O	2.6
	corr	S	4.8
		V	1.4
		O	2.4
O	wh	O	4.5
		S	2.0
		V	2.8
	corr	O	4.5
		S	1.5
		V	2.8
V	wh	V	3.9
		S	1.7
		O	2.5
	corr	V	4.1
		S	1.4
		O	2.1