

Expression of information structure in Slavic: Experiments and modeling

Radek Šimík and Marta Wierzba
University of Potsdam / SFB 632

Kolloquium Slawistische Linguistik
Humboldt University Berlin, June 16th 2014

How is information structure expressed in West Slavic languages?

Common view: In Slavic languages information structure gets primarily expressed by word order. (In English, it is primarily expressed by prosody.)

Our view: The expression of information structure is primarily prosodic in Slavic languages (and only secondarily word-order-based).

Optionality

- Syntax generates more outputs for a single meaning (example: focus in situ, focus fronting).
- Free (non-feature-driven) external and internal merge (Chomsky's recent work).

Gradiance

- Some outputs might be preferred over others (without those being unacceptable).
- We capture this by a post-syntactic Linear OT model.
- This model also allows for precise evaluation of (competing) hypotheses.

Basic notions: Givenness

Givenness

An expression α is **given** if and only if it is in the common ground that there is an expression β in the preceding discourse such that

- if $\llbracket \alpha \rrbracket \in D_e$, then $\llbracket \alpha \rrbracket = \llbracket \beta \rrbracket$
- if $\llbracket \alpha \rrbracket \in D_{\langle \sigma, t \rangle}$ (for any type σ), then $\llbracket \alpha \rrbracket \supseteq \llbracket \beta \rrbracket$

Examples

A: Did you speak to [β Eddy]?

B: Sorry, I don't know [α Eddy].

A: Look, Jane is eating a [β carrot].

B: Yeah, she loves [α vegetables].

Basic notions: Focus

Focus

An expression α in a background $[\beta \dots \alpha \dots]$ is **focused** if there is a salient set of alternatives to β generated by replacing α with expressions of the same type.

Examples

A: Who surprised you the most yesterday?

B: $[\beta [\alpha \text{ My first-year } \underline{\text{student}}] \text{ surprised me}]$.

A: I'm afraid that the window remained open.

B: I think that the teacher $[\beta [\alpha \underline{\text{closed}}] \text{ the window}]$.

Rooth 1985, 1992, Kratzer 1991.

Prosody-IS interface constraints

In English, givenness and focus are expressed prosodically.

NUCLEAR STRESS RULE

Place sentence stress on the rightmost constituent in a clause.

STRESS FOCUS

Place sentence stress on the focused constituent.

*STRESS GIVEN

Do not place sentence stress on given constituents.

NSR: Chomsky & Halle 1968, Truckenbrodt 1995; SF: Jackendoff 1972, Rooth 1985;
*SG: Halliday 1967, Féry & Samek-Lodovici 2006.

“Free word order” in Slavic languages

In Slavic, information structure is expressed by word order.

Example: given-left, focus-right

A: Kdo nakrmil psa? (Cz)

‘Who fed the dog?’

B: Psa nakrmil Milan.

dog.acc fed Milan.nom

cf. Milan fed the dog.

Two hypotheses of how this comes about

The syntactic approach

information structure \leftrightarrow word order

The prosodic approach

information structure \leftrightarrow prosody \leftrightarrow word order

The syntactic hypothesis

A special constraint relating IS and word order is postulated.

Mathesius (1939)

Theme > Rheme (“objective order”)

Firbas (1971)

less communicatively dynamic > more communicatively dynamic

Kučerová (2007, 2012)

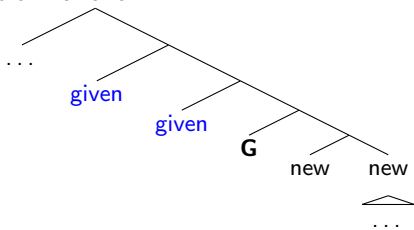
given > new

Biskup (2011), Mykhaylyk (2011)

[... given/old/specific ... [_{VP} ... new/non-specific...]]

The syntactic hypothesis: Kučerová's version

Grammatical marking of givenness: In Czech (K 2007) and other Slavic languages (K 2012), a “G-operator” is inserted at LF. This operator marks everything in its scope (outside its c-command domain) as given. If a given expression is not marked by G as given, this results in a Maximize Presupposition violation. If a new expression is marked as given, this results in a presupposition failure.



Note: Kučerová's theory is comparatively easy to test because the notion of givenness (and newness) can be very well defined and mapped onto data.

The prosodic hypothesis

Using the constraints assumed for English: STRESS FOCUS (SF), *STRESS GIVEN (*SG), NUCLEAR STRESS RULE (NSR)

Deriving the word order indirectly: via IS-prosody constraints

A: Kdo nakrmil psa? (Cz)
'Who fed the dog?'

Previous analyses for other languages: Zubizarreta 1998, Neeleman & Reinhart 1998, Szendrői 2001, a.o.

The prosodic hypothesis

Using the constraints assumed for English: STRESS FOCUS (SF), *STRESS GIVEN (*SG), NUCLEAR STRESS RULE (NSR)

Deriving the word order indirectly: via IS-prosody constraints

A: Kdo nakrmil psa? (Cz)

'Who fed the dog?'

B₁: Psa nakrmil Milan. SF *SG NSR

'Milan fed the dog.'

The prosodic hypothesis

Using the constraints assumed for English: STRESS FOCUS (SF), *STRESS GIVEN (*SG), NUCLEAR STRESS RULE (NSR)

Deriving the word order indirectly: via IS-prosody constraints

A: Kdo nakrmil psa? (Cz)

'Who fed the dog?'

B₁: Psa nakrmil Milan. SF *SG NSR

B₂: Milan nakrmil psa. SF *SG NSR

'Milan fed the dog.'

The prosodic hypothesis

Using the constraints assumed for English: STRESS FOCUS (SF), *STRESS GIVEN (*SG), NUCLEAR STRESS RULE (NSR)

Deriving the word order indirectly: via IS-prosody constraints

A: Kdo nakrmil psa? (Cz)

'Who fed the dog?'

B₁: Psa nakrmil Milan. SF *SG NSR

B₂: Milan nakrmil psa. SF *SG NSR

B₃: Milan nakrmil psa. SF *SG NSR

'Milan fed the dog.'

The prosodic hypothesis

Using the constraints assumed for English: STRESS FOCUS (SF), *STRESS GIVEN (*SG), NUCLEAR STRESS RULE (NSR)

Deriving the word order indirectly: via IS-prosody constraints

A: Kdo nakrmil psa? (Cz)

'Who fed the dog?'

B₁: Psa nakrmil Milan. SF *SG NSR

B₂: Milan nakrmil psa. SF *SG NSR

B₃: Milan nakrmil psa. SF *SG NSR

'Milan fed the dog.'

Rationale: Slavic uses free word order to maximize the satisfaction of IS-prosody constraints.

Previous analyses for other languages: Zubizarreta 1998, Neeleman & Reinhart 1998, Szendrői 2001, a.o.

Testing the hypotheses: Experimental part

We designed experiments where we manipulate three factors to create patterns predicted by the syntactic and/or the prosodic hypothesis:

- Word order
- Position of stress
- IS-status (**focused**, **given**, new/broad focus)

Testing the hypotheses: Modeling part

In order to evaluate the predictions and to estimate the effect sizes of individual constraints in a precise manner, we use Linear Optimality Theory/LOT (Keller 2000; see also Featherston 2005).

In this framework, each constraint is associated with a numeric weight representing the reduction in acceptability caused by a violation of this constraint. If more than one constraint is violated in a sentence, the weights add up in a cumulative manner.

Procedure: Each experimental item is manually annotated wrt the constraints that are violated in it. The optimal weight for each constraint based on all experiments is then computed by multiple regression. A separate computation is conducted for the prosodic, syntactic, and combined approach and for each language.

Constraints: The prosodic hypothesis

*STRESS GIVEN

Do not place sentence stress on given constituents.

NUCLEAR STRESS RULE

Place sentence stress on the rightmost constituent in a clause.

Note: We're leaving STRESS FOCUS aside for the moment.

For Slavic: NSR: Daneš 1957, Sgall et al. 1980, Junghanns 2002; *SG: Petřík 1938, Daneš 1957.

Constraints: The syntactic hypothesis

*NEW>GIVEN

Do not place a given constituent after a new constituent within a clause.

NUCLEAR STRESS RULE

Place sentence stress on the rightmost constituent in a clause.

For Slavic: NSR: Daneš 1957, Sgall et al. 1980, Junghanns 2002; *N>G: Kučerová 2007, 2012.

Constraints: The unification of both hypotheses

*STRESS GIVEN

Do not place sentence stress on given constituents.

*NEW>GIVEN

Do not place a given constituent after a new constituent within a clause.

NUCLEAR STRESS RULE

Place sentence stress on the rightmost constituent in a clause.

Note: The hypotheses are not mutually exclusive.

Experiments: general information

- **Participants:** 40 students in Prague (native speakers of Czech), 40 students in Poznań (native speakers of Polish); 40 students in Bratislava (native speakers of Slovak)
- **Materials:** auditive stimuli consisting of a context utterance and a target sentence; all experiments within a single experimental set-up (forming fillers to each other); always nearly twice as many fillers than experimental items
- **Task/procedure:** participants were instructed to rate the target sentence in the given context; acceptability ratings on a 1–9 scale via computer keyboard. We report normalized z-score values.

Note: We only report results of the Czech and Polish experiments. Slovak is very close to Czech. The results are reported in an appendix.

Experiments: overview

Experiment 1

What happens in an all-new context?

Experiment 2

Which positions are acceptable for a given object?

Experiment 3a

Is stress-shift from a given object an alternative to scrambling?

Experiment 3b

How do focused objects behave?

Experiment 1

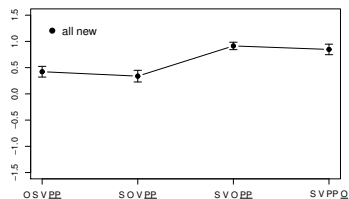
factor: position of the object; sentence stress was always on the rightmost element; 32 items (plus 104 fillers)

Scrambling the object in an all-new context

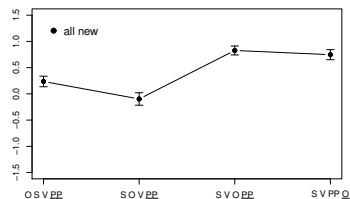
- (C) Píšou něco zajímavého v novinách?
'Is there anything interesting in the newspaper?'
- (a) Dnes prý své zastupitele Němci volí do parlamentu. OSVPP
'Today the Germans allegedly vote their representatives to the parliament.'
- (b) Dnes prý Němci své zastupitele volí do parlamentu. SOVPP
- (c) Dnes prý Němci volí své zastupitele do parlamentu. SVOPP
- (d) Dnes prý Němci volí do parlamentu své zastupitele. SVPPQ

Results of experiment 1

Czech



Polish



In both Czech and Polish, the postverbal conditions are significantly better than the preverbal conditions.

Experiment 2

factor 1: position of the object; factor 2: givenness of the subject;
sentence stress was always on the rightmost element; 32 items (plus 104 fillers)

Scrambling a given object (subject is new)

- (C) Zjistil jsi, proč dnes sekretářka tak nadávala? (Cz)
'Did you find out why our secretary was so angry today?'
- (a) Protože prý sekretářku Karel poslal do obchodu. OSVPP
'Because Karel allegedly sent the secretary to the store.'
- (b) Protože prý Karel sekretářku poslal do obchodu. *N>G SOVPP
- (c) Protože prý Karel poslal sekretářku do obchodu. *N>G SVO~~PP~~
- (d) Protože prý Karel poslal do obchodu sekretářku. *SG *N>G SVPPO

Experiment 2

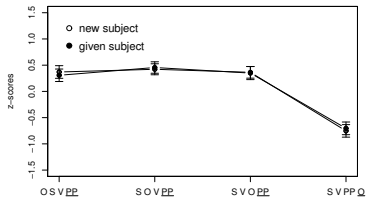
factor 1: position of the object; factor 2: givenness of the subject;
sentence stress was always on the rightmost element; 32 items (plus 104 fillers)

Scrambling a given object (subject is given)

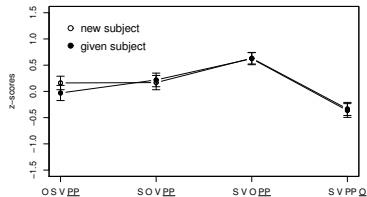
- (C) Zjistil jsi, proč dnes sekretářka nadávala na Karla? (Cz)
'Did you find out why our secretary was so angry with Karel today?'
- (a) Protože prý sekretářku Karel poslal do obchodu.
'Because Karel allegedly sent the secretary to the store.' OSVPP
- (b) Protože prý Karel sekretářku poslal do obchodu. SOVPP
- (c) Protože prý Karel poslal sekretářku do obchodu. *N>G SVO^{PP}
- (d) Protože prý Karel poslal do obchodu sekretářku. *SG *N>G SVPP^O

Results of experiment 2

Czech



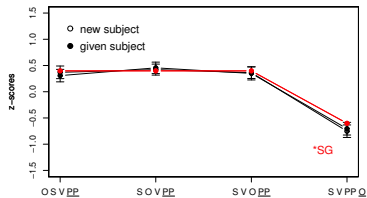
Polish



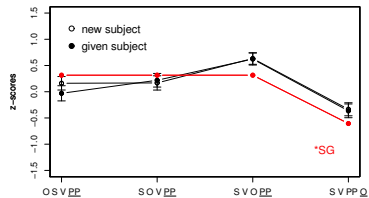
In both Czech and Polish, the condition where the given object is rightmost/carries stress is judged the worst. In Polish, in addition, there is a preference for a postverbal position of the given object.

Prosodic model (exp 2)

Czech

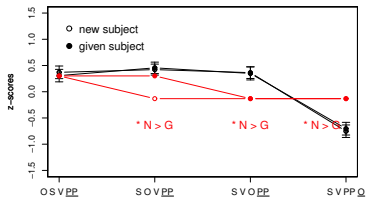


Polish

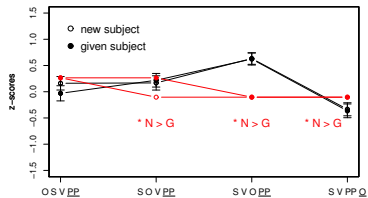


Syntactic model (exp 2)

Czech

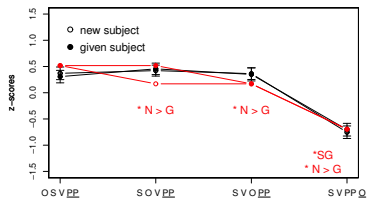


Polish

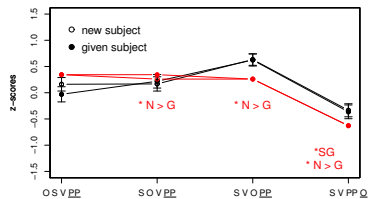


Combined model (exp 2)

Czech



Polish



Experiment 3a

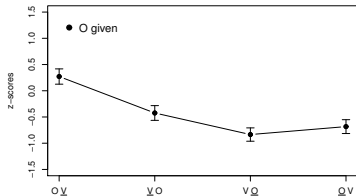
factor 1: word order (SVO vs. SOV); factor 2: sentence stress (on V vs. on O); the object was always given; 48 items (plus 88 fillers)

Stress shift and scrambling (given object)

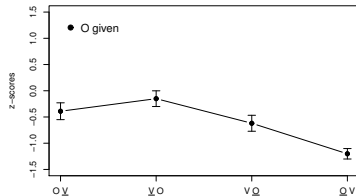
- (C) Doufám, že ta bouřka nerozbije to okno. (Cz)
'I hope that the storm will not break this window.'
- (a) Myslím, že učitelka **to okno** zavřela. *N>G SOV
'I think that the teacher closed this window.'
- (b) Myslím, že učitelka zavřela **to okno**. NSR *N>G SVO
- (c) Myslím, že učitelka zavřela **to okno**. *SG *N>G SVO
- (d) Myslím, že učitelka **to okno** zavřela. *SG NSR *N>G SOV

Results of experiment 3a

Czech



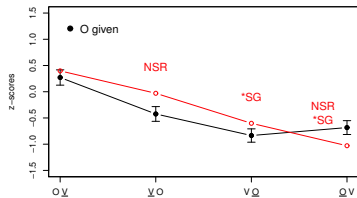
Polish



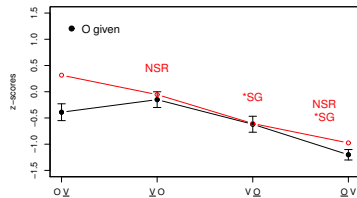
In both Czech and Polish, the conditions where the given object is stressed are judged the worst. In addition, Czech prefers scrambling, while Polish prefers stress shift/basic word order.

Prosodic model (exp 3a)

Czech

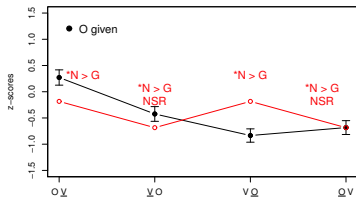


Polish

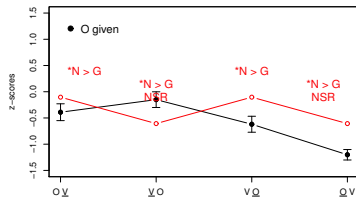


Syntactic model (exp 3a)

Czech

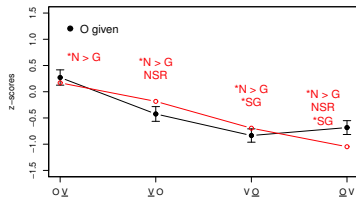


Polish

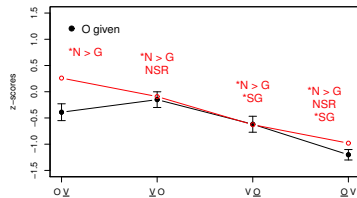


Combined model (exp 3a)

Czech



Polish



Experiment 3b

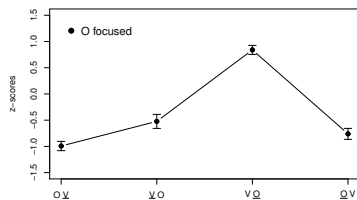
factor 1: word order (SVO vs. SOV); factor 2: sentence stress (on V vs. on O); the object was always focused; 48 items (plus 88 fillers)

Stress shift and scrambling (focused object)

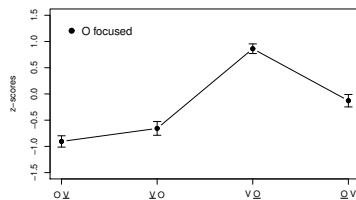
- (C) Nevíš, co učitelka zavřela? (Cz)
'Do you know what the teacher closed?'
- (a) Myslím, že učitelka to okno zavřela.
'I think that the teacher closed this window.' *SG *N>G SOV
- (b) Myslím, že učitelka zavřela to okno. *SG NSR SVO
- (c) Myslím, že učitelka zavřela to okno. SVO
- (d) Myslím, že učitelka to okno zavřela. NSR *N>G SOV

Results of experiment 3b

Czech



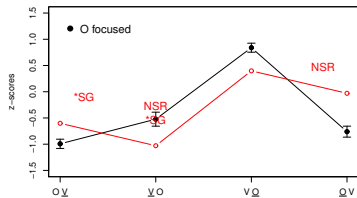
Polish



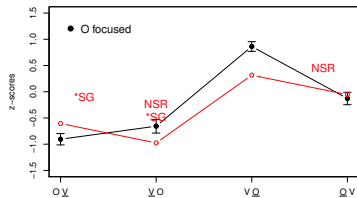
In both Czech and Polish, base order and stress on the focused object is the best rated condition. In Polish, scrambling the focused object is relatively acceptable compared to the conditions where the object is not stressed.

Prosodic model (exp 3b)

Czech

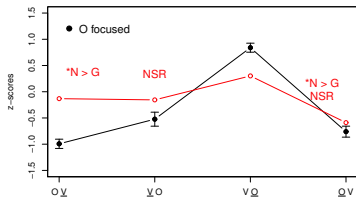


Polish

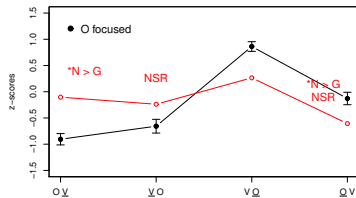


Syntactic model (exp 3b)

Czech

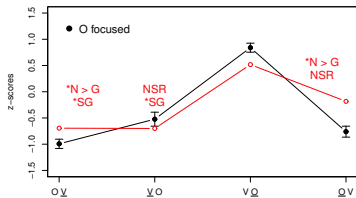


Polish

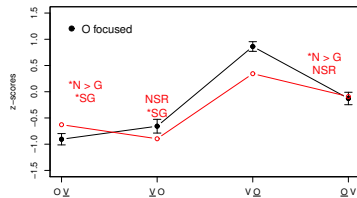


Combined model (exp 3b)

Czech



Polish



Comparison of the models

Prosodic model

	Czech		Slovak		Polish	
	estimate	SE	estimate	SE	estimate	SE
(Intercept)	0.40	0.02	0.29	0.02	0.32	0.02
*STRESS-GIVEN	-1.00	0.03	-0.79	0.03	-0.92	0.03
NUCLEAR STRESS RULE	-0.43	0.03	-0.38	0.03	-0.37	0.03
	Adj. R-squared: 0.2881		Adj. R-squared: 0.1851		Adj. R-squared: 0.2332	

Syntactic model

	Czech		Slovak		Polish	
	estimate	SE	estimate	SE	estimate	SE
(Intercept)	0.44	0.02	0.30	0.02	0.27	0.02
*NEW>GIVEN	-0.62	0.03	-0.43	0.03	-0.37	0.03
NUCLEAR STRESS RULE	-0.50	0.03	-0.46	0.04	-0.50	0.04
	Adj. R-squared: 0.1822		Adj. R-squared: 0.1067		Adj. R-squared: 0.0987	

Combined model

	Czech		Slovak		Polish	
	estimate	SE	estimate	SE	estimate	SE
(Intercept)	0.52	0.02	0.36	0.02	0.34	0.02
*STRESS-GIVEN	-0.86	0.03	-0.71	0.03	-0.89	0.03
NUCLEAR STRESS RULE	-0.35	0.03	-0.34	0.03	-0.35	0.03
*NEW>GIVEN	-0.35	0.03	-0.21	0.03	-0.08	0.03
	Adj. R-squared: 0.3138		Adj. R-squared: 0.1939		Adj. R-squared: 0.2345	

Note: For each model all constraints had a significant influence.

For each language, a comparison of R-squared values of the models shows that the prosodic model explains more of the variance in the results than the syntactic model. According to ANOVAs, these differences are significant ($p < 0.001$). The combined model is in turn better than the prosodic model; this difference is also significant in all languages ($p < 0.001$ for Czech and Slovak, $p = 0.003$) for Polish. However, the proportion of variance explained by the combined model increases by less than one percent for Slovak and Polish and by less than three percent for Czech.

Conclusion: The expression of IS in West Slavic is primarily prosodic.

Constraint weight

Cohen (1988) distinguishes between three categories of effect sizes calculated as a factor of standard deviation, where a value around 0.2 standard deviations is considered a small effect, around 0.5 standard deviations a medium effect, and around 0.8 a large effect. We assume that the estimates for the constraint weights correspond to this measure.

Constraint effect sizes/weights for the combined model

	Czech	Slovak	Polish	
*STRESS GIVEN	-0.86	-0.71	-0.89	large
NUCLEAR STRESS RULE	-0.35	-0.34	-0.35	small-medium
*NEW>GIVEN	-0.35	-0.21	-0.08	small

Further adjustments to the prosodic model

Can the prosodic model be made better by adding further constraints?

We try the following two one-by-one:

STRESS FOCUS

Place sentence stress on the focused constituent.

*MOVE

Do not move constituents (without motivation).

*MOVE: Reinhart 1995, Grimshaw 1997 (formulated as STAY)

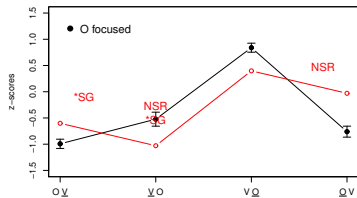
Experiment 3b

Stress shift and scrambling (focused object)

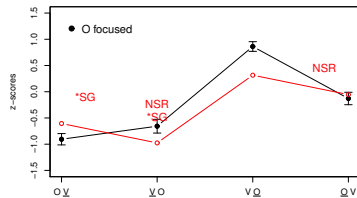
- (C) Nevíš, co učitelka zavřela? (Cz)
'Do you know what the teacher closed?'
- (a) Myslím, že učitelka to okno zavřela.
'I think that the teacher closed this window.' *SG SF SOV
- (b) Myslím, že učitelka zavřela to okno. *SG SF NSR SVO
- (c) Myslím, že učitelka zavřela to okno. SVO
- (d) Myslím, že učitelka to okno zavřela. NSR SOV

Prosodic model (exp 3b)

Czech

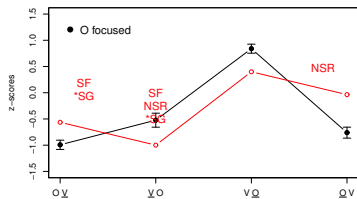


Polish

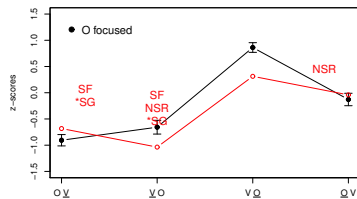


Prosodic model + STRESS FOCUS (exp 3b)

Czech



Polish



Comparison of the models

Prosodic model

	Czech		Slovak		Polish	
	estimate	SE	estimate	SE	estimate	SE
(Intercept)	0.40	0.02	0.29	0.02	0.32	0.02
*STRESS-GIVEN	-1.00	0.03	-0.79	0.03	-0.92	0.03
NUCLEAR STRESS RULE	-0.43	0.03	-0.38	0.03	-0.37	0.03
	Adj. R-squared: 0.2881		Adj. R-squared: 0.1851		Adj. R-squared: 0.2332	

Prosodic model + STRESS FOCUS

	Czech		Slovak		Polish	
	estimate	SE	estimate	SE	estimate	SE
(Intercept)	0.40	0.02	0.29	0.02	0.31	0.02
*STRESS-GIVEN	-1.03	0.04	-0.79	0.04	-0.85	0.04
NUCLEAR STRESS RULE	-0.44	0.03	-0.38	0.03	-0.35	0.03
STRESS FOCUS	0.07	0.05	0.01	0.05	-0.14	0.05
	Adj. R-squared: 0.2883		Adj. R-squared: 0.1849		Adj. R-squared: 0.2344	

Note: Significant improvement only for Polish (though only by 0.1%).

Our results suggest that *STRESS GIVEN is much stronger than STRESS FOCUS or in fact that STRESS FOCUS has no effect at all. One could take this as support for the assumption that only givenness but not focus is a grammatical category (in a broader sense of the word), see e.g. Kadmon & Sevi 2011. But there are reasons to be careful. First, we know that if something is given and focused at the same time, it must receive stress (suggesting that SF is stronger than *SG). Second, our items included plenty of *SG violations but comparatively few SF violations. Moreover, the SF violations present in the items can also be explained by *SG violations (they overlap).

Conclusion: Our experiments are not fit to measure the strength of the STRESS FOCUS constraint.

Experiment 1

Scrambling the object in an all-new context

(C) Píšíou něčo zajímavého v novinách?

'Is there anything interesting in the newspaper?'

(a) Dnes prý své zastupitele Němci volí do parlamentu.

*MOVE OSVPP

'Today the Germans allegedly vote their representatives to the parliament.'

(b) Dnes prý Němci své zastupitele volí do parlamentu.

*MOVE SOVPP

(c) Dnes prý Němci volí své zastupitele do parlamentu.

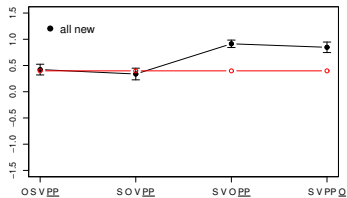
SVOPP

(d) Dnes prý Němci volí do parlamentu své zastupitele.

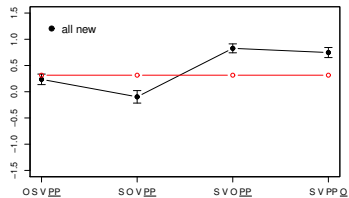
SVPPQ

Prosodic model (exp 1)

Czech

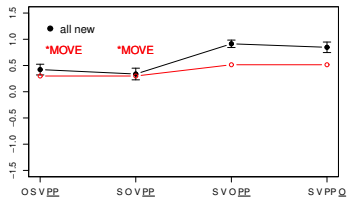


Polish

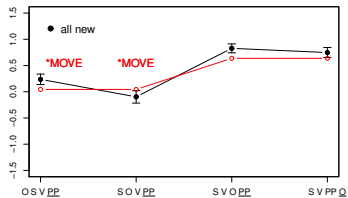


Prosodic model + *MOVE (exp 1)

Czech



Polish



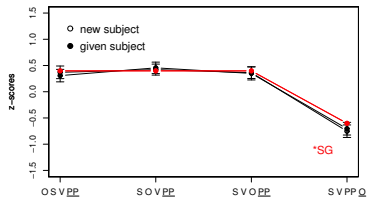
Experiment 2

Scrambling a given object (subject is new)

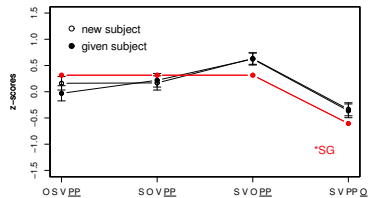
- (C) Zjistil jsi, proč dnes sekretářka tak nadávala? (Cz)
'Did you find out why our secretary was so angry today?'
- (a) Protože prý sekretářku Karel poslal do obchodu. *MOVE OSVPP
'Because Karel allegedly sent the secretary to the store.'
- (b) Protože prý Karel sekretářku poslal do obchodu. *MOVE SOVPP
- (c) Protože prý Karel poslal sekretářku do obchodu. SVOPP
- (d) Protože prý Karel poslal do obchodu sekretářku. *SG SVPPQ

Prosodic model (exp 2)

Czech

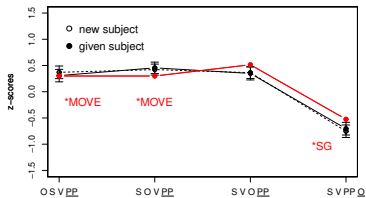


Polish

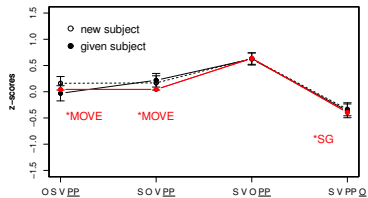


Prosodic model + *MOVE (exp 2)

Czech



Polish



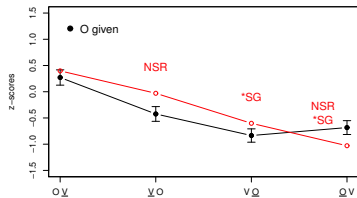
Experiment 3a

Stress shift and scrambling (given object)

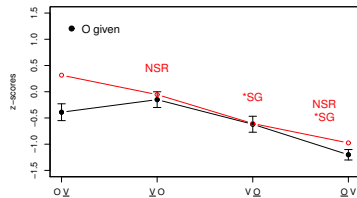
- (C) Doufám, že ta bouřka nerozbije to okno. (Cz)
'I hope that the storm will not break this window.'
- (a) Myslím, že učitelka to okno zavřela. *MOVE SOV
'I think that the teacher closed this window.'
- (b) Myslím, že učitelka zavřela to okno. NSR SVO
- (c) Myslím, že učitelka zavřela to okno. *SG SVO
- (d) Myslím, že učitelka to okno zavřela. *SG NSR *MOVE SOV

Prosodic model (exp 3a)

Czech

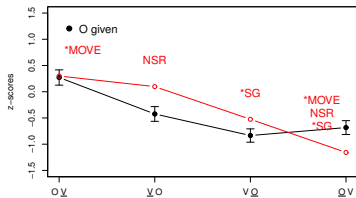


Polish

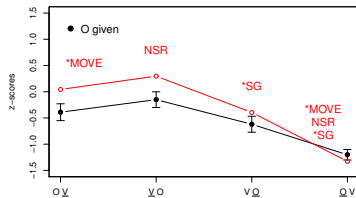


Prosodic model + *MOVE (exp 3a)

Czech



Polish



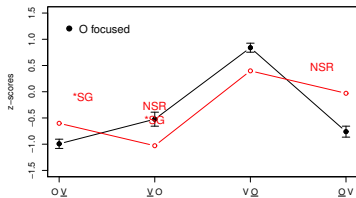
Experiment 3b

Stress shift and scrambling (focused object)

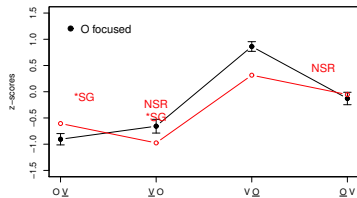
- (C) Nevíš, co učitelka zavřela? (Cz)
'Do you know what the teacher closed?'
- (a) Myslím, že učitelka to okno zavřela.
'I think that the teacher closed this window.' *SG *MOVE SOV
- (b) Myslím, že učitelka zavřela to okno. *SG NSR SVO
- (c) Myslím, že učitelka zavřela to okno. SVO
- (d) Myslím, že učitelka to okno zavřela. NSR *MOVE SOV

Prosodic model (exp 3b)

Czech

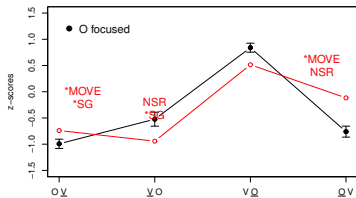


Polish

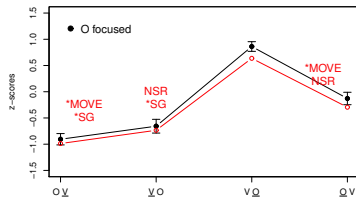


Prosodic model + *MOVE (exp 3b)

Czech



Polish



Comparison of the models

Prosodic model

	Czech		Slovak		Polish	
	estimate	SE	estimate	SE	estimate	SE
(Intercept)	0.40	0.02	0.29	0.02	0.32	0.02
*STRESS-GIVEN	-1.00	0.03	-0.79	0.03	-0.92	0.03
NUCLEAR STRESS RULE	-0.43	0.03	-0.38	0.03	-0.37	0.03
	Adj. R-squared: 0.2881		Adj. R-squared: 0.1851		Adj. R-squared: 0.2332	

Prosodic model + *MOVE

	Czech		Slovak		Polish	
	estimate	SE	estimate	SE	estimate	SE
(Intercept)	0.51	0.02	0.46	0.02	0.64	0.02
*STRESS-GIVEN	-1.04	0.03	-0.85	0.03	-1.03	0.03
NUCLEAR STRESS RULE	-0.42	0.03	-0.36	0.03	-0.34	0.03
*MOVE	0.21	0.02	0.30	0.03	-0.59	0.02
	Adj. R-squared: 0.2997		Adj. R-squared: 0.2083		Adj. R-squared: 0.3208	

Note: Significant improvement for all three languages, though most clear for Polish (8.7%).

Our results show that the *MOVE constraint (Reinhart, Grimshaw) might be operative in all three languages. For Czech and Slovak, its effect is rather small. This is due to the conflicting effects observed for focused and given constituents: while focused constituents clearly disprefer scrambling (exp 3b), given constituents prefer scrambling over stress shift (exp 3a) and freely allow scrambling without any effect on the output (exp 2). The situation is different in Polish, where scrambling is the dispreferred option independently of the IS-status of the constituent (exp 2, 3a, 3b), yielding the comparatively large effect of the *MOVE constraint in the model as well as the overall improvement of the model with *MOVE.

Conclusion: Parametrization within West Slavic wrt to whether (unmotivated) movement is penalized.

Overall conclusion

How is information structure expressed in West Slavic languages?

Overall conclusion

How is information structure expressed in West Slavic languages?

Primarily prosodically, secondarily by word order. More particularly:

Overall conclusion

How is information structure expressed in West Slavic languages?

Primarily prosodically, secondarily by word order. More particularly:

- Most variation in our data is explained by prosodic constraints (*STRESS GIVEN and NUCLEAR STRESS RULE).

Overall conclusion

How is information structure expressed in West Slavic languages?

Primarily prosodically, secondarily by word order. More particularly:

- Most variation in our data is explained by prosodic constraints (*STRESS GIVEN and NUCLEAR STRESS RULE).
- Adding a word-order constraint (*NEW>GIVEN) results only in a slight improvement of the model.

Overall conclusion

How is information structure expressed in West Slavic languages?

Primarily prosodically, secondarily by word order. More particularly:

- Most variation in our data is explained by prosodic constraints (*STRESS GIVEN and NUCLEAR STRESS RULE).
- Adding a word-order constraint (*NEW>GIVEN) results only in a slight improvement of the model.

The role of other constraints:

- There is a strong influence of *MOVE for Polish.
- The role of STRESS FOCUS is an open issue.

Broader implication: Autonomous syntax

We interpret our overall results as an argument in favor of “autonomous syntax”, i.e. a syntactic system that is “uncontaminated by information structure” and potentially other pragmatic features (Fanselow 2006, 2008, Horváth 2010, Fanselow & Lenertová 2011). We see that even in discourse-configurational languages like the West Slavic languages, prosody is primary in the expression of information structure. Syntax is involved only secondarily, as a tool to maximize constraint satisfaction. The effect of purely syntactic constraints on IS (*NEW>GIVEN) is found to be minor and it is a matter of future research to determine whether it cannot be attributed to non-IS factors (definiteness/specificity/presuppositionality).

- Balance constraint violation across the experimental setup.
- Discern scrambling from other types of movement (A from A' movement; ad exp 1, 2: the OSVPP condition; ad exp 3b: compare focus scrambling to focus A' movement).
- Discern givenness from definiteness/specificity (cf. Šimík & Wierzba, under review).
- If possible, test further syntactic hypotheses.

References

- Biskup, P. 2011. *Adverbials and the phase model*. John Benjamins.
- Chomsky, N. & M. Halle. 1968. *The sound pattern of English*. Harper and Row.
- Cohen, J. 1988. *Statistical power analysis for the behavioral sciences*. Erlbaum.
- Daneš, F. 1957. *Intonace a věta ve spisovné češtině*. Československá akademie věd.
- Fanselow, G. 2006. On pure syntax (uncontaminated by information structure). In *Form, structure, and grammar*, 137-157. Akademie-Verlag.
- Fanselow, G. 2008. In need of mediation: The relation between syntax and information structure. *Acta Linguistica Hungarica* 55, 397-413.
- Fanselow, G. & D. Lenertová. 2011. Left peripheral focus: Mismatches between syntax and information structure. *Natural Language & Linguistic Theory* 29, 169-209.
- Featherston, S. 2005. The decathlon model of empirical syntax. In *Linguistic evidence: Empirical, theoretical, and computational perspectives*, 187-208. Mouton de Gruyter.
- Féry, C. & V. Samek-Lodovici. 2006. Focus projection and prosodic prominence in nested foci. *Language* 82, 131-150.
- Firbas, J. 1971. On the concept of communicative dynamism in the theory of functional sentence perspective. *Sborník prací Filozofické fakulty Brněnské univerzity* A19, 135-144.
- Grimshaw, J. 1997. Projections, heads, and optimality. *Linguistic Inquiry* 28, 373-422.

References

- Halliday, M. 1967. *Intonation and grammar in British English*. Mouton.
- Horváth, J. 2010. Discourse features, syntactic displacement, and the status of contrast. *Lingua* 120, 1346-1369.
- Jackendoff, R. 1972. *Semantic interpretation in generative grammar*. MIT Press.
- Junghanns, U. 2002. Informationsstrukturierung in slavischen Sprachen: Zur Rekonstruktion in einem syntax-zentrierten Modell der Grammatik. Habilitation thesis, University of Leipzig.
- Kadmon, N. & A. Sevi. 2011. Without focus. In *The Baltic International Yearbook of Cognition, Logic and Communication, Vol. 6: Formal semantics and pragmatics: Discourse, context, and models*. New Prairie Press.
- Keller, F. 2000. *Gradience in grammar*. PhD thesis, University of Edinburgh.
- Kratzer, A. 1991. The representation of focus. In *Semantics: An international handbook of contemporary research*, 825-834. Walter de Gruyter.
- Kučerová, I. 2007. The syntax of givenness. PhD thesis, MIT.
- Kučerová, I. 2012. Grammatical marking of givenness. *Natural Language Semantics* 20, 1-30.
- Mathesius, V. 1939. O tak zvaném aktuálním členění větěm. *Slovo a slovesnost* 5, 171-174.
- Mykhaylyk, R. 2011. Middle object scrambling. *Journal of Slavic Linguistics* 19, 231-272.
- Neeleman, A. & T. Reinhart. 1998. Scrambling and the PF interface. In *The projection of arguments: Lexical and compositional factors*, 309-353. CSLI Publications.

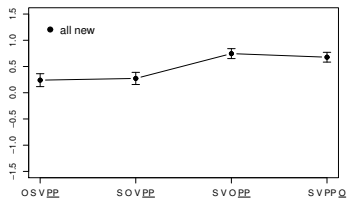
References

- Petřík, S. 1938. *O hudební stránce středočeské věty*. Filosofická fakulta University Karlovy.
- Reinhart, T. 1995. Interface strategies. OTS Working Papers in Theoretical Linguistics.
- Rochemont, M. 1986. *Focus in generative grammar*. John Benjamins.
- Rooth, M. 1985. Association with focus. PhD thesis, University of Massachusetts.
- Rooth, M. 1992. A theory of focus interpretation. *Natural Language Semantics* 1, 75-116.
- Sgall, P., E. Hajičová & E. Buráňová. 1980. *Aktuální členění věty v češtině*. Academia.
- Šimík, R. & M. Wierzba. under review. The role of givenness, presupposition, and prosody in Czech word order: An experimental study. University of Potsdam/SFB632.
- Szendrői, K. Focus and the syntax-phonology interface. PhD thesis, University College London.
- Truckenbrodt, H. 1995. Phonological phrases: Their relation to syntax, focus, and prominence. PhD thesis, MIT.
- Wagner, M. 2012. Focus and givenness: A unified approach. In *Contrasts and positions in information structure*, 102-147. Cambridge University Press.
- Zubizarreta, M. L. 1998. *Prosody, focus, and word order*. MIT Press.

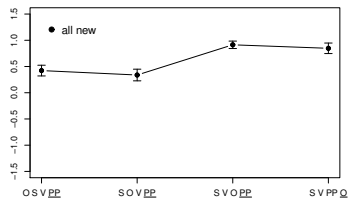
Results and models for Slovak (as compared to Czech)

Results of experiment 1

Slovak

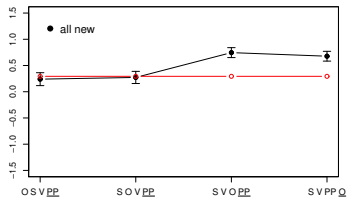


Czech

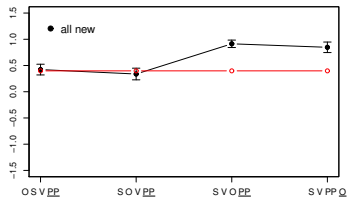


Prosodic model (exp 1)

Slovak

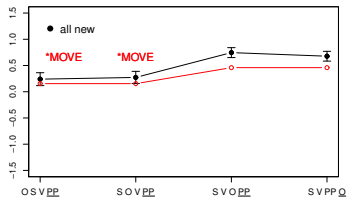


Czech

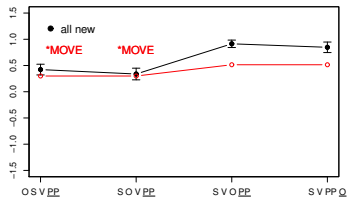


Prosodic model + *MOVE (exp 1)

Slovak

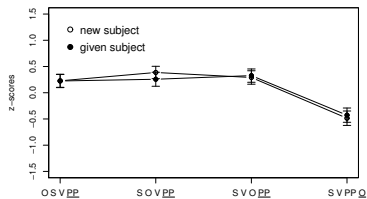


Czech

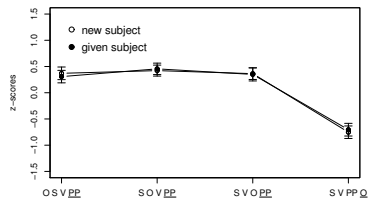


Results of experiment 2

Slovak

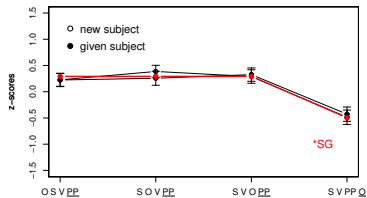


Czech

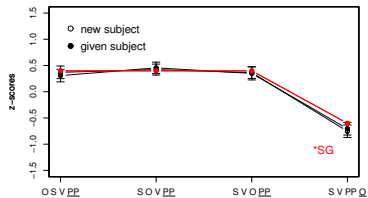


Prosodic model (exp 2)

Slovak

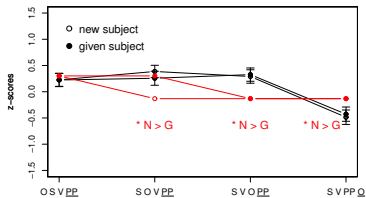


Czech

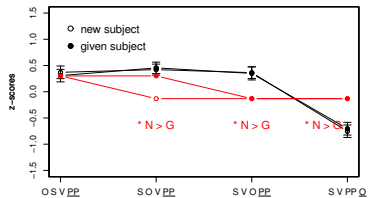


Syntactic model (exp 2)

Slovak

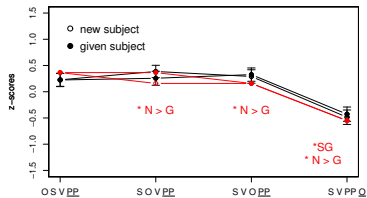


Czech

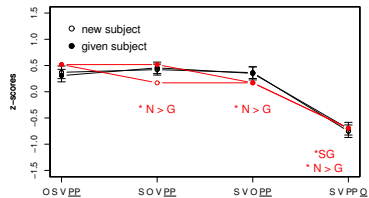


Combined model (exp 2)

Slovak

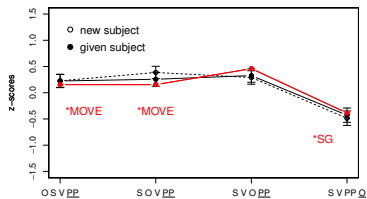


Czech

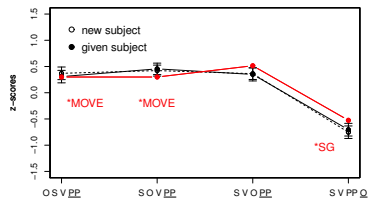


Prosodic model + *MOVE (exp 2)

Slovak

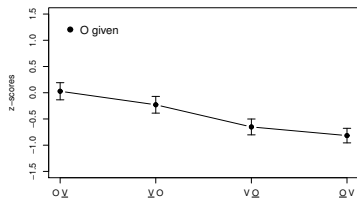


Czech

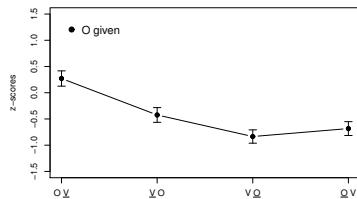


Results of experiment 3a

Slovak

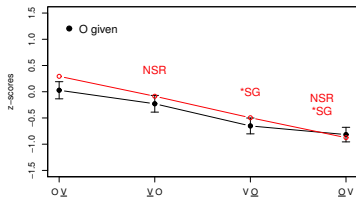


Czech

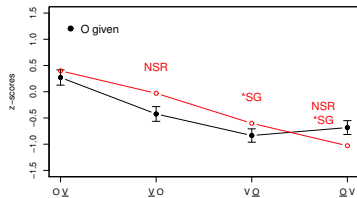


Prosodic model (exp 3a)

Slovak

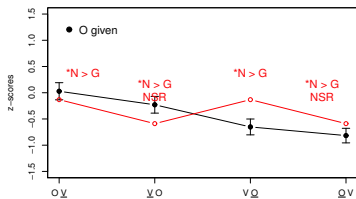


Czech

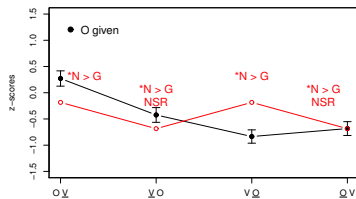


Syntactic model (exp 3a)

Slovak

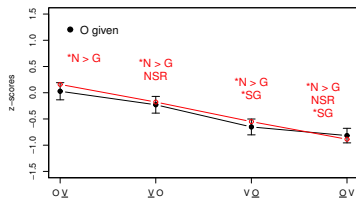


Czech

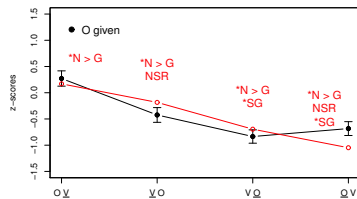


Combined model (exp 3a)

Slovak

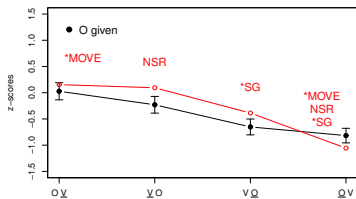


Czech

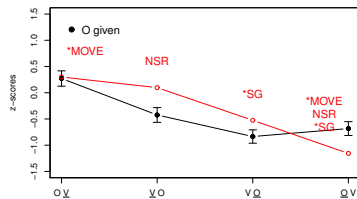


Prosodic model + *MOVE (exp 3a)

Slovak

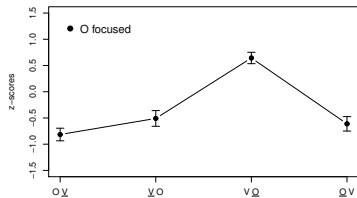


Czech

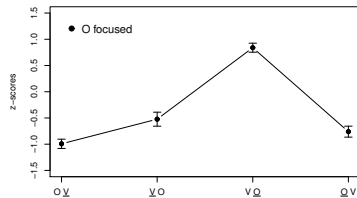


Results of experiment 3b

Slovak

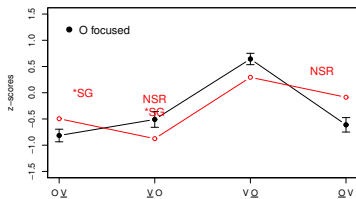


Czech

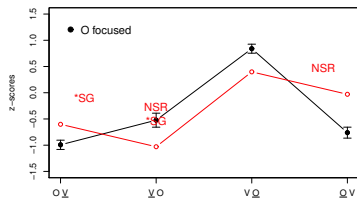


Prosodic model (exp 3b)

Slovak

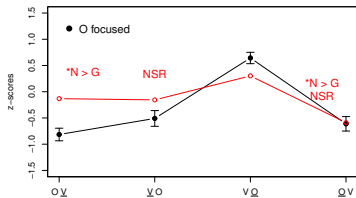


Czech

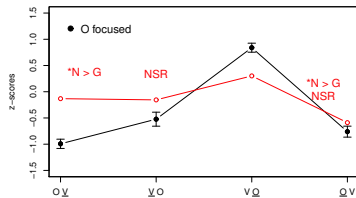


Syntactic model (exp 3b)

Slovak

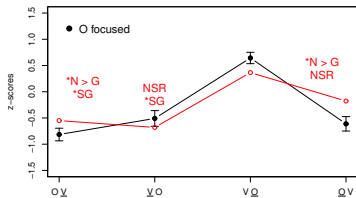


Czech

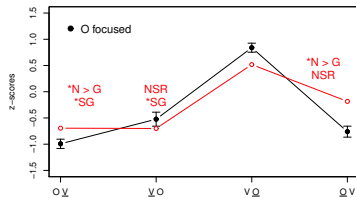


Combined model (exp 3b)

Slovak

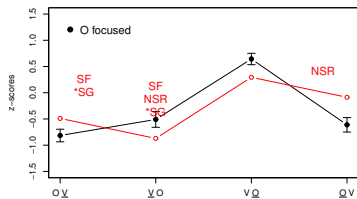


Czech

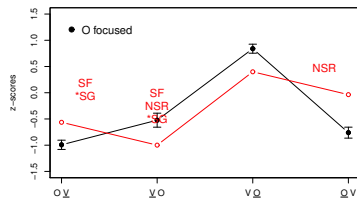


Prosodic model + STRESS FOCUS (exp 3b)

Slovak

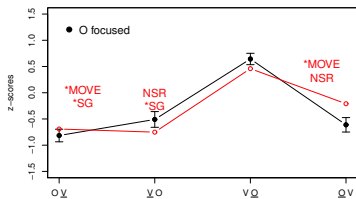


Czech



Prosodic model + *MOVE (exp 3b)

Slovak



Czech

