Auditory cues determine allomorphy

Vocalized and non-vocalized prepositions in Czech

Kateřina Chládková

Phonetic Sciences, University of Amsterdam

Amsterdam Center for Language and Communication ACLC

I. Non-syllabic prepositions

non-vocalized form	vocalized form	meaning
k	ke	'to'
v	ve	'in'
s	se	'with'
z	ze	'from'

Always **vocalized**:
- *ke kolu* 'to a bike'

Always **non-vocalized**:
- *k tomu* 'to that'
- *k autu* 'to a car'

Both **vocalized** and **non-vocalized**:

ke psovi 30 %	– *k psovi* 70 %	'to a dog'
ke škvíře 90 %	– *k škvíře* 10 %	'to a chink'
ke plotu 10 %	– *k plotu* 90 %	'to a fence'
ke psu 90 %	– *k psu* 10 %	'to a dog'

← Previous Explanations →

Articulatory ease
- **BUT**: no problem with producing complex clusters such as /ks/, /sk/, /pstr/, why not /ksk/ then?

Yers
- **BUT**: predicts **k kolu, *se ptákem*
- not transparent anymore

⇒ ONSET COMPLEXITY MATTERS

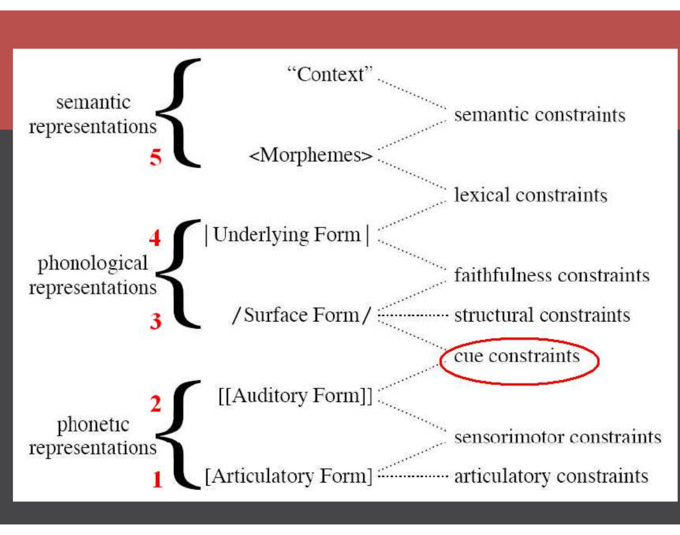
II. The explanation I propose: prepositional vocalization is listener-oriented

Perceptual ease
- the /ε/ is inserted so that the listener can recover the preposition
- **auditory cues** almost exclusively determine the choice between the vocalized and non-vocalized prepositional forms
- the speaker has **no articulatory difficulty with e.g. [kː]** but the listener would not be able to recover the preposition

- OCP-like effect (McCarthy 1986, Rubach 2000, Boersma 2000)
- structural constraints against what can be a word contribute as well (cf. *ke psu* BUT *k psovi*)
- /ε/ inserted in SF (because if present it is stressed)
- UF prefers |k| (*k* is much more frequent)
- simulations show that such a grammar is learnable

III. The analysis

- modeled in Bidirectional Phonetics and Phonology in parallel *BiPhon* (Boersma 2007, 2008)
- 5 levels of representations used in the present analysis (the Tableaus below collapse the Aud.F. and the Art.F.)
- constraints that operate at a level of representation and constraints evaluating the mapping between levels
- Stochastic Optimality Theory as the evaluation strategy



IV.a Simple onsets

- $*[C_iC_i]_{Art}$ → do not produce two adjacent identical separate consonantal articulatory gestures
- */CC/ [_C:] → an auditorily prolonged single consonant that follows a pause does not correspond to two consonantal segments in the SF
- */ / [x] → the presence of auditory events does not correspond to the absence of a segment in the SF

Production of <to + a bike>:

ranking value	100	100	100	100	80	50
<to + a bike>	*<to> |kε|	$*[C_iC_i]_{Art}$	*/CC/ [_C:]	**/ / [x]	DEP	*<to> |k|
|k + kolu| /.kko.lu./ [kkolu]		*!				*
|k + kolu| /.kko.lu./ [kːolu]			*!			*
|k + kolu| /.kko.lu./ [kεkolu]				*!		*
☞ |k + kolu| /.kε.ko.lu./ [kεkolu]					*	*
|kε + kolu| /.kε.ko.lu./ [kεkolu]	*!					

Failed comprehension of [kːolu] when <to + a bike> intended:

ranking value	100	100	100	100	100	80	80	50	50	50
[kːolu]	*<to> | |	$*[C_iC_i]_{Art}$	*/CC/ [_C:]	**/ / [x]	**/x/ [ ]	MAX	DEP	*<to> |k|	*<coke$_{Acc.}$> |kolu|	*<a bike$_{Acc.}$> |kolu|
☞ /.ko.lu./ |kolu| <coke$_{Acc.}$>									*	
/.ko.lu./ |kolu| <to + a bike>	*!									*
/.ko.lu./ |k + kolu| <to + a bike>						*!		*		*
/.kε.ko.lu./ |k + kolu| <to + a bike>					*!		*	*		*
/.kko.lu./ |k + kolu| <to + a bike>			*!					*		*

IV.b Cue constraints: Complex onsets

Dissimilar consonantal cues auditorily = different segments in the SF.

C = /place/ [formant] + /manner/ [noise, silence] + /voicing/ [periodicity]

/k/ = velar + plosive + voiceless; /p/ = bilabial + plosive + voiceless; /s/ = alveolar + fricative + voiceless

⇒ /kps/ = 6 different cues

☞ optimally: /CCC/ = 8 cues, /CCCC/ = 10 cues

- */CCC/[6cue] → 6 different consonantal cues do not correspond to 3 consonantal segments in the SF

*[10*cue*]/*CCCC*/ <<*[9*cue*]/*CCCC*/ << *[6*cue*]/*CCCC*/ ... etc.
*[6*cue*]/*CCC*/ <<*[6*cue*]/*CCCC*/ ... etc.

Cue constraints interact with DEP:

ranking value	82	80.1	80	78	frequency
	*[7*cue*] /*CCCC*/	*[6*cue*] /*CCC*/	DEP	*[7*cue*] /*CCC*/	of this winner
1. < to + a fence >					
☞ |k + plotu| /.kplo.tu./ [kplotu]				*	77%
|k + plotu| /.kε.plo.tu./ [kεplotu]			*!		23%
2. < to dogs >					
☞ |k + psuːm| /.kpsuːm./ [kpsuːm]		*			48%
☞ |k + psuːm| /.kε.psuːm./ [kεpsuːm]			*		52%
3. < to + a chink >					
|k + ʃkviːr̝ε| /.kʃkviː.r̝ε./ [kʃkviːr̝ε]	*!				19%
☞ |k + ʃkviːr̝ε| /.kε.ʃkviː.r̝ε./ [kεʃkviːr̝ε]			*		81%

V. When the cue constraints are not enough

Both *ke psovi* and *k psovi* are attested,
and we also observe *ke psu* (but *NOT k psu*). (all are <to + a dog >)
This cannot be handled by the cue constraints introduced above.
⇒ there are three structural constraints:
- *FEETUN → feet are not monosyllabic
- MINWORD → a light monosyllable is not a prosodic word
- *ONSETCCC → onsets are not composed of 3 or more segments

☞ these constraints work both in HG (see Tableau on the right),
☞ as well as in OT under the **local conjunction** approach (Smolensky 1997).

constraint weight	15	10	5	5	
	DEP	*ONSETCCC	MINWORD	*FEETUN	*harmony*
☞ <to + us> |k + naːm| /.knaːm./				-1	-5
<to + us> |k + naːm| /.kε.naːm./	-1				-15
<to + a dog> |k + psu| /.kpsu./		-1	-1	-1	-20
☞ <to + a dog> |k + psu| /.kε.psu./	-1				-15
☞ <to + dogs> |k + psuːm| /.kpsuːm./		-1		-1	-15
☞ <to + dogs> |k + psuːm| /.kε.psuːm./	-1				-15
☞ <to + a dog> |k + psovi| /.kpso.vi./		-1			-10
<to + a dog> |k + psovi| /.kε.pso.vi./	-1				-15
☞ <to + CV> |k + CV| /.kCV./			-1	-1	-10
<to + CV> |k + CV| /.kE.CV./	-1				-15

author correspondence: k.chladkova@uva.nl