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On the Origins of the Prosodic Word in Russian

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Abstract

The Prosodic Word (Pwd) is a foundational notion in phonological theories, being relevant for the statement of many phonological generalizations. In spite of this importance, basic open questions remain about prosodic words. How many distinct prosodic categories, even at the 'word' level, are available to languages? Are they innately determined or emergent? Can their structure in one language vs. another be predicted? In this paper I consider a research program that attempts to address such questions by viewing prosodic words as emergent over time from the interaction of phonetics, phonologization, and syntactic structure. An important bridging idea in this understanding of prosodic words is that of domain generalization.

Index Terms: prosodic word, domain generalization, Russian

1. Introduction

The Prosodic Word (Pwd) occupies a central position in the theory of Prosodic Phonology, e.g. [1], [2], [3], [4], [5]. A key motivation for the Pwd, as separate from the morphosyntactic word, is the lack of isomorphism between the two kinds of word. For example, word-final devoicing in Russian affects open-class lexical items but not prepositions, leading to contrasts like *sa**t** mʲiˈxailə* 'Mikhail's garden' vs. *pə**d** mɐsˈkvoj* 'near Moscow', in which the underlying /d/ of /sad/ 'garden' is devoiced (cf. *sada* 'garden (gen.)') but the /d/ of the preposition /pod/ is not. This contrast, among other facts, leads many researchers to conclude that the first phrase consists of two prosodic words, i.e. [sat]$_{\text{Pwd}}$ [mʲiˈxailə]$_{\text{Pwd}}$, while the second consists of one, i.e. [pəd mɐsˈkvoj]$_{\text{Pwd}}$, and to assume that devoicing affects consonants at the end of the prosodic word [6], [7], [8], [9], see discussion and references in [10].

The phonological word is arguably relevant to phonetic theories as well. For example, there is evidence that segmental duration [11] and degree of coarticulation [12] at word boundaries can depend on prosodic word structure.

In spite of its longstanding importance, many basic unanswered questions persist about the prosodic word (see discussion in [13]). How many prosodic categories, even at the 'word' level, are available to languages? How precisely are they dependent on morphosyntactic structure? Are these categories innately given or emergent, and if the latter, how do they emerge? It is much easier to ask these questions than to answer them, and this paper has the modest goal of entertaining a research program in which prosodic words (and possibly other higher prosodic constituents) are viewed as constructs that emerge over time through the interaction of phonetics, phonologization, and syntactic structure. A key component of this pursuit is something called *domain generalization*.

2. Domain generalization

Word-final devoicing as in Russian is attested in many unrelated languages. The account of it detailed in this section follows [14].

2.1. Phonetics-phonology mismatch

Many researchers have posited that word-final devoicing originates as a phonologization of utterance-final phonetic devoicing (e.g., [15], [16]). Gradient utterance-final devoicing occurs in many languages and can be attributed to a drop in sub-glottal pressure toward the end of an utterance [17] as well as spreading of the vocal folds in anticipation of a non-speech breathing posture (e.g., [18], [19]). In addition, it has been argued that an obstruent voicing contrast might be hard to perceive unless the relevant obstruents directly precede a sonorant consonant or vowel [20]; since utterance-final consonants precede a pause, there may be perceptual as well as articulatory underpinnings to devoicing. These phonetic underpinnings are relevant to utterance-final position, but not to word-final position (putting aside words that happen to be utterance-final). In phrasal contexts like *sa**t** mʲiˈxailə*, in which the word-final obstruent is utterance-medial and precedes a sonorant, there are no articulatory or perceptual underpinnings for word-final devoicing analogous to those described above. Yet many languages have phonologized final devoicing specifically at the level of the word all the same.

2.2. Domain generalization

The idea of *domain generalization* is that language learners, even while encountering a generalization about utterance-final position, are predisposed to learn them as word-final. Suppose that phonological generalizations are built from a store of lexical representations [21], [22]. It is plausible to assume also that we store many more words than phrases or utterances. First, we encounter many more words than phrases or utterances (since words make up phrases and utterances). Second, words are also easier to remember, because they tend to be shorter than phrases or utterances, and a given word is reinforced in memory more often by repeated exposure than a given phrase or utterance. Words are therefore a more likely source of generalization.

Domain generalization implies that word-final devoicing comes about in the following way. At an initial stage of a given language (here we entertain the scenario using Modern Russian forms), devoicing begins as a phonetically motivated utterance-final process, as in Stage 2 below. At this stage words like /sad/ 'garden' are realized with final devoicing when they occur in utterance-final position but not elsewhere. But under the influence of the many stored devoiced variants like [sat] of words like /sad/, the learner generalizes devoicing to *all* words. This is Stage 3. This process can be seen underway in Polish, where some dialects maintain utterance-final devoicing and others have innovated word-final devoicing [23].

Stage 1	/**sad** vixodʲit v drugoj **sad**/
(No devoicing)	[**sad** vixodʲit v drugoj **sad**]
	'The garden lets out onto another garden'
Stage 2	/**sad** vixodʲit v drugoj **sad**/
(Utterance-final devoicing)	[**sad** vixodʲit v drugoj **sat**]
Stage 3	/**sad** vixodʲit v drugoj **sad**/
(Word-final devoicing)	[**sat** vixodʲit v drugoj **sat**]

2.3. Artificial grammar experiment

In order to test the hypothesis that learners are biased toward word-based generalizations, as domain generalization implies, two artificial grammar experiments were carried out in [14]. Participants were exposed to constructed languages in which both voiced and voiceless obstruents occurred in syllable onset position but word-final obstruents were only observed in utterance-final position and were only voiced or voiceless (depending on experimental condition). Participants were thus implicitly given information about the voicing of word-final obstruents in utterance-final position, but no information about word-final obstruent voicing otherwise, a poverty of stimulus design ([24], [25], [26]). Results showed learning of the utterance-final devoicing (or voicing) generalization. For example, participants in the final devoicing condition preferred test sentences like *santa pas* to *santa paz*, showing learning of the generalization implicit in the learning data that utterance-final obstruents be voiceless. More importantly, they preferred sentences like *santa pas mizupu* to *santa paz mizupu*, even though no stimuli of the learning phase contained word-final obstruents in utterance-medial position. They thus extended the learned pattern to word-final position even for words in utterance-medial position, supporting domain generalization.

3. The Russian prosodic word

3.1. The prosodic word as emergent

What facts motivate the Russian Pwd? As noted above, an important motivation comes from the facts of final devoicing and prepositions. According to this diagnostic, a preposition (or string of prepositions) plus one open-class lexical item constitute a prosodic word, e.g., [pəd mʁsˈkvoj]$_{\text{Pwd}}$, 'near Moscow'. Devoicing is Pwd-final, accounting for the lack of devoicing in /pod/ 'near'. Voicing assimilation among obstruents also occurs within the Pwd, as in [pʁt ˈpapəj]$_{\text{Pwd}}$ 'under papa' from /pod ˈpapa/.

Russian also has various enclitics, and these also trigger voicing assimilation, as in [ˈsog ʐʲi] 'juice (emphatic)' from /sok ʐʲe/, cf. [ˈsok tə] 'juice (topical)'; or [ˈsat tə] 'garden (topical)' from /sad to/, cf. [ˈsad ʐʲi] 'garden (emphatic)'. Such voicing assimilation does not occur as readily across the boundaries of open-class lexical items, suggesting that enclitics might also be incorporated into the Pwd. However, final devoicing applies before these enclitics, as can be seen whenever an enclitic begins with a sonorant, e.g. [ˈsok lʲi] 'juice (interrogative)' and (crucially) [ˈsat lʲi] 'garden (interrogative)'. If devoicing is Pwd-final, then enclitics cannot be within the prosodic word in such examples.

Such considerations lead researchers to posit two 'word-like' prosodic levels for Russian, which we might call the 'prosodic word' and 'clitic group' or the 'minimal' and 'maximal' prosodic word, or which we might distinguish in some other way. One structure argued for is shown in Figure 1 (see [10], [27] for detailed arguments). In this structure the preposition /iz/ and noun /knʲig/ group together as a Pwd (notated ω). However, the interrogative enclitic /lʲi/ is outside of this Pwd (incorporated directly into the prosodic phrase), accounting for the final devoicing of /knʲig/.

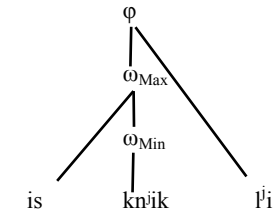

Figure 1: *Prosodic structure for proclitics vs. enclitics*

Though this structure succeeds in capturing the necessary distinctions, it raises the question: why is the structure like this? For example, prosodic theory makes equally available the structure given in Figure 2. Does the actual structure in Figure 1 follow from anything else we know about Russian, or is the choice arbitrary?

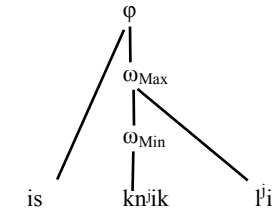

Figure 2: *Prosodic structure for proclitics vs. enclitics*

In the conventional approach within prosodic theory to facts like final devoicing in Russian, phonological constituency is taken as logically prior (even if derived by constraints that relate morphosyntactic structure to prosodic structure), and facts like final devoicing are seen as a consequence, driven by prosodic structure (among other things). This approach has great appeal, but it also comes with well known unresolved questions. For example, just how many prosodic categories are there, and how they are defined or related to morphosyntactic structure? Even within a single language, let alone across languages, different phonological processes or phenomena often seem to diagnose different domains for something like the Pwd. This fact has led to different kinds of response, including a proliferation of prosodic categories on the one hand, versus allowing for prosodic recursion or violations of strict layering on the other. (See discussion and references in [13].)

An alternative approach to prosodic categories views those categories not as logically prior to the phonological phenomena they motivate, but in some sense as *derived from* those phenomena. Different phonological phenomena lead to

Pwd-like behavior *independently*, so that what counts as a 'Pwd' will depend on what phenomenon is in question; they need not converge on one answer. This is the view advocated in [28], for example, which argues that "prosodic domains are language-particular, intrinsic and highly specific properties of individual phonological rules or constraints". This view of the relationship between prosodic structure and phonological phenomena obviously eliminates the problem discussed above of proliferation of prosodic categories. Equally obviously, though, it raises its own questions. Are the categories employed by particular languages really as numerous as this view would seem to imply? Most important, if phonological phenomena are logically prior and prosodic categories derived from them, then how does this happen?

The discussion of Russian final devoicing below envisions one way that a language-specific Pwd-like unit might come about.

Word-final devoicing, as we have seen, arises historically when utterance-final devoicing (which is phonetically motivated) is generalized to the ends of all words. The hypothetical stage of Russian at which this occurs is repeated below, where the noun [sat] 'garden' appears in utterance-final position. This explanation of the origin of word-final devoicing makes an interesting prediction: if a class of word systematically fails to occur in utterance-final position, it may systematically fail to undergo devoicing in any position. It will never be subject to word-final devoicing, because there will be no utterance-final tokens of that class from which to generalize devoicing. There is such a class in Russian: prepositions can never appear in utterance-final position, because they cannot be stranded, with very marginal exceptions [29]. That is, structures like the second below, involving the preposition /pod/ 'near', are systematically impossible in Russian.

Utterance-final noun	/**sad** vixodʲit v drugoj **sad**/ [**sad** vixodʲit v drugoj **sa<u>t</u>**] 'The garden lets out onto another **garden'**
Utterance-final preposition	*/v kakom gorodʲe naxodʲitsʲa **pod**/ *[f kɐkom gorədʲɪ nɐxodʲɪtsə **po<u>t</u>**] 'Which city does she live **near**?'

It is in fact the preposition in Russian that stands apart in not undergoing final devoicing, and it is this fact about prepositions which provides perhaps the best-known motivation for the Russian Pwd. The idea, then, is that domain generalization, assumed here to be the source of word-final devoicing, did not affect the class of prepositions, because Russian speakers had no experience of utterance-final prepositions and therefore no experience of devoiced prepositions.

If these ideas are on the right track, it is the array of facts this historical scenario engendered that leads the phonologist to posit the Pwd. However, it does not follow from this idea that notions like the Pwd are imaginary or relevant only to linguists. Russian learners might well posit an organizational unit like the Pwd in response to the Russian facts, especially if this unit is useful in other ways. (Indeed, [28] suggests that if enough processes appear to target the same domain they will have "a gravitating effect within the system, attracting phonological patterns which evolve in the course of sound change"). This idea is further addressed below. However, the suggestion here does imply an understanding in which the Pwd is not, for example, an innate category provided by a universal grammar (see again [28] on this point). Rather, it *emerges* from a complex interaction of factors, including phonetic facts (providing the underpinning of utterance-final devoicing), phonologization (with domain generalization a key component of phonologization, extending the generalization to open-class words in any position), and syntactic structure (explaining the exceptionality of prepositions).

3.2. Other evidence for the Russian prosodic word

What other facts motivate the Russian Pwd? There are at least two other noteworthy lines of evidence.

First, the Pwd is traditionally held to be the domain of lexical stress in Russian. Put another way, prepositions are part of the lexical stress domain: they do not carry stress independently; more importantly, a stress that 'belongs to' a following noun sometimes retracts onto the preposition itself, as in [ˈpod ruku] 'by the arm', compare [pəd ruˈkoj] 'at hand' [6], [7].

Second, the Pwd is relevant to the statement of vowel reduction facts [30], [27]. The vowels /o/ and /a/ reduce to [ə] when unstressed – compare [ˈgo**o**t] 'year' to [gədɐˈvoj] 'annual' (from /godoˈvoj/) and [ˈpr**a**f] 'law (gen.sg.)' to [prəvɐˈvoj] 'legal' (from /pravoˈvoj/. An exception is when these vowels immediately precede the stressed syllable of a word; in such cases the relevant syllable is much longer and the vowel is realized as something like [ɐ] [31], also seen in the examples above. This exception only applies within words, however: the word-final /o/ of /ˈmalo/ in /ˈmalo ˈskazano/ 'little said' reduces completely even though it precedes a stressed syllable in the following word: [ˈmal**ə** ˈskazənə]. It is significant, therefore, that pretonic reduction is to [ɐ] also for prepositions, e.g., [pɐt ˈpapəj]$_{\text{Pwd}}$ 'under papa' from /pod ˈpapa/, further supporting the analysis of such sequences as involving single Pwds.

That fact that at least three independent phonological processes – final devoicing, stress, and vowel reduction – apparently converge on the same Pwd analysis for preposition + word complexes presents a challenge for the view that Pwds emerge from the interaction of syntactic, phonetic, and phonological factors, as suggested here. If a domain such as Pwd is not given in advance but emerges as suggested above, how do these independent processes converge on the same domain? One possible answer is that speakers indeed posit Pwds based on facts like those of devoicing (or one of the other processes mentioned above), but that once posited, the Pwd can become relevant for, or even contribute to initiating, other phonological processes. In such a view, though not innate, Pwds are real, grammaticized organizational units, and we might hold to the expectation that there are few such categories. However, this understanding of Pwds would be relatively hard to distinguish from the view that they are innate.

Further research is required to understand best how the Russian facts bear on these questions, but some evidence is already at hand that what we call a Pwd in Russian actually depends on which phenomenon we look at. One example comes from facts analyzed in [27]. A certain kind of Russian compound can take stress in each member, e.g., *ˌbombə-uˈbʲeʐʸiβʲːə* 'bomb shelter' and *ˌmʲedʸ-instʲiˈtut* 'medical institute'. This fact suggests an analysis of such compounds as

involving two Pwds: [ˌbombə]$_{Pwd}$-[uˈbʲezˠʲiʃʲːə]$_{Pwd}$. Yet a word-final /o/ or /a/ in the first member of such compounds does not reduce to [ə] but to [ɐ] e.g., ˌ*saxərɐ*-ˈ*varnʲɪ* 'sugar refinary' from /ˌsaxar**o**-ˈvarnʲa/. The vowel reduction facts therefore suggest an analysis of such compounds as involving *one* Pwd: [ˌsaxər**ɐ**-ˈvarnʲɪ]$_{Pwd}$. (Cf. [ˈmal**ə**]$_{Pwd}$ [ˈskazənə]$_{Pwd}$, discussed above.) Likewise final devoicing does not target the first word of such compounds, as the example ˌ*mʲedˠ-instʲiˈtut* shows. Of course, these inconsistencies are a problem only if we expect all phonological processes to point to one and the same 'Pwd'.

4. Conclusions

The sources of evidence for something like the Pwd are diverse, including segmental phonology like final devoicing, but also facts about rhythm or stress, tone, apparent reference to morphosyntactic features, and effects of frequency. The discussion here has had nothing to say about the potential origins of phenomena other than word-final devoicing and the means by which they also converge on something like the prosodic word. But the point of this paper is that we might begin to make sense of the sometimes conflicting evidence about prosodic words, and explain aspects of their structure, if we view them as organizational constructs that emerge over time from the interaction of independently posited properties of a language. The hope is that this kind of thinking can be applied to these other sources of evidence as well.

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