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Allophonic Variation in the Polish Vowel /ɨ/: Results of a 3D Ultrasound Study and their Phonological Implications*

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Abstract: This article presents new data on allophonic variation of the Polish vowel commonly transcribed as /ɨ/ and frequently analyzed as phonologically back (e.g., Rubach 1984; Gussmann 2007). The new data were collected using 3D ultrasound images from ten native speakers of Polish. While vowels in the context of labial and dental stops do not differ significantly, being articulated with a high front position of the tongue in both environments, the /ɨ/ assimilates to preceding velar stop consonants and is produced with relatively more raising of the tongue body and with a constriction extending further back. This is to be expected if /ɨ/ is taken to be a front vowel that assimilates to a [+back] consonant. This finding has potential consequences for the analysis of palatalization in Polish.

1. Introduction

Apart from the extensive system of assimilatory palatalizations resulting in sequences of palatalized consonants followed by front vowels, Polish also exhibits a constraint that cannot be easily labeled as an assimilation. In particular, the vowel /ɨ/ does not normally follow a velar stop (although it can follow a velar fricative) in native vocabulary (*kɨ*, *gɨ*). The constraint is somewhat mysterious, given the current standard assumption that Polish /ɨ/ functions in phonology as a back (unrounded centralized) vowel (Rubach 1981, 1984; Gussmann 1980, 1992, 2007; Szpyra 1995; Rydzewski 2017; Czaplicki 2013, 2019; and many others), which should make it perfectly compatible with a back consonant. This idiosyncrasy has theoretical implications that we shall explore below. This study reports on the results of an articulatory investigation of /ɨ/ in various consonantal environments using 3D ultrasound methodology. We will argue that the results of the study indicate that /ɨ/ in modern Polish in the

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context of labial and dental stops is a front vowel, while in the context of velar sounds the constriction in /ɨ/ extends further into the back vowel region. The existence of the allophonic variant supports the analysis of /ɨ/ as a front vowel that is modified in the context of a velar stop to assimilate to its backness. On the other hand, this allophony is difficult to explain under the assumption that /ɨ/ is a back vowel in the neutral context of labial or coronal stops.

While making an argument based on phonetic evidence, we assume is that features are abstract categories with a set of phonetic correlates, which may be acoustic, articulatory, or both (cf. e.g., Hayes 2009: 75). The interpretation of phonological features as abstract entities with phonetic correlates follows the core research in phonological feature theory, starting with Jakobson and Halle 1956, Chomsky and Halle 1968, and Halle 1983, among others. The abstract categories necessarily have to be anchored in phonetics. They remain stable as long as they have a relation to verifiable phonetic facts. Hayes and Steriade (2004: 14) call it the stabilization problem—"the problem of maintaining the (relatively) stable phonology in the face of extensive variation in the phonetic factors that govern the phonological constraints"—and review different formal solutions to it.

In general, it is nowadays not particularly controversial to assume that the functioning of phonological categories reflects or is constrained to a large degree by phonetics (Natural Phonology, e.g., Stampe 1973; Grounded Phonology, e.g., Archangeli and Pulleyblank 1994; Feature Geometry, e.g., Halle 1995; Dispersion Theory, e.g., Flemming 1995; Functional Phonology, e.g., Boersma 1998). A bone of contention is how and to what extent phonetic information is present in phonology (see Hayes and Steriade 2004 and references therein). The approaches range from encoding phonetic information directly in Optimality Theoretic constraints (e.g., Pater 1999; Kager 1999; Flemming 2001) to postulating separate modules of grammar that encode phonetic detail (e.g., P-map in Steriade 2008) to accounting for the phonetic patterns in phonology by reference to diachronic language change and mechanisms connected to language perception and learning (e.g., Blevins and Garrett 2004). The articulatory data we present can be interpreted in the most straightforward way in a model incorporating phonetic information directly into phonological constraints. However, the arguments remain valid even if we move phonetic detail outside of phonology per se, given some formal approach to the stabilization problem.

In the rest of this section, we will set the discussion of *Kɨ (i.e., kɨ and gɨ) sequences in a broader context of controversies surrounding Polish /ɨ/ (section 1.1.) and discuss the choice of the methodology used to investigate the articulation of /ɨ/ (section 1.2). Section 2 describes in detail the methodology we employed. Section 3 presents the results of the ultrasound study. Section 4 moves on to discuss the results and their consequences for the interpretation

of the phonological system of Polish and beyond, and section 5 summarizes the findings.

1.1. Setting the Stage

A broadly accepted assumption is that Polish has six oral vowel phonemes, written orthographically as *i, y, e, a, o*, and *u*, and most often transcribed as /i, ɨ, e, a, o, u/. Among them, the vowel /i/ in particular has been the focus of many phonological debates. First, some early analyses assume the pair of vowels [i]-[ɨ] to be allophones of one phoneme, parallel to some analyses of Russian (Avanesov 1956; Avanesov and Sidorov 1945). Indeed, the pair /i/-/ɨ/ patterns like the pairs of allophones of all other Polish vowels, which we will elaborate on below. However, a number of arguments speak for the phonemic status of /ɨ/, irrespective of the assumptions about its featural make-up. The arguments for the phonemic status of /ɨ/ include phonological ones (e.g., Rubach 1984) as well as native speakers' intuition. For a review of arguments, see, for example, Rydzewski 2017. While we believe that the evidence supports the analysis of /ɨ/ as a separate phoneme, this assumption has no consequences for the analysis presented in this paper.

As mentioned earlier, all oral vowels in Polish—except for /i/ and /ɨ/—participate in an allophonic alternation conditioned by a neighboring consonant. They are reportedly fronted and raised when the preceding and/or following consonant has a prepalatal (alveopalatal) or palatal place of articulation (/t͡ɕ, d͡ʑ, ɕ, ʑ, ɲ, j/), as in (1), cf. Sawicka 1995; Wiśniewski 1997. Recent articulatory-acoustic evaluations point to tongue root advancement in the context of a prepalatal consonant as the consistent effect of the process across all vowels and speakers, with inconsistent collateral raising and fronting (Lulich and Cavar 2019).

(1) (Pre)palatal-context vowel allophony

/u/: neutral context [u] (e.g., *tupać* 'to stump')
vs. prepalatal context [ʉ] (*Maciuś* 'person name')

/e/: neutral context [ɛ] (e.g., *test* 'test')
vs. prepalatal context [e] (*sieć* 'net')

/o/: neutral context [ɔ] (e.g., *sos* 'sauce')
vs. prepalatal context [ɵ] (*cioć* 'aunt, gen pl')

/a/: neutral context [a] (e.g., *tak* 'yes')
vs. prepalatal context [ä] (*ciaśniej* 'tighter')

In contrast, the vowels /i/ and /ɨ/ do not have two allophones each. Instead, the two vowels observe the same phonotactic distribution as allophones of all the

other vowels and show the same involvement of tongue root phonetically (Ća-var 2007), where /i/ patterns with prepalatal-context vocalic allophones and /ɨ/ patterns with 'neutral' consonant-context vowel allophones. Therefore, Ćavar 2007 and Lulich and Cavar 2019 concluded that /i/ and /ɨ/ are both high front vowels, supporting descriptions in, e.g., Wierzchowska 1980. In particular, like the prepalatal-context allophones of other vowels in Polish, /ɨ/ shows a conspicuous advancement of the tongue root.[1] This analysis stands in sharp contrast with the common assumption that /ɨ/ is a back vowel. If we take /ɨ/ to be a back vowel, then we have no way to express the affinity between /i/ and /ɨ/ as being parallel to the allophonic relationships of the other vowels.

The assumption that /ɨ/ is a back vowel is in itself a necessary consequence of the standard analysis of palatalization as triggered by front vowels. Some authors observe the fact that /ɨ/ is not a back vowel phonetically, however, they analyze /ɨ/ as a back vowel based on phonological arguments (e.g., Gussman 2007). Since surface /ɨ/ does not trigger a phonetic palatalization of consonants the way /i/ does, it has been argued to be a back vowel, contrary to phonetic descriptions that align /ɨ/ with front rather than with back vowels. If, however, palatalization is triggered by /i/ that is [+ATR] and not triggered by /ɨ/ that is [–ATR], cf. Ćavar 2007, we do not need to propose an abstract analysis of /ɨ/ as a back vowel, attributing palatalization to the advancement of the tongue root instead. Thus we believe that /ɨ/ is a front vowel and that no abstract analysis is necessary to account for palatalization producing surface-palatal(ized) consonants.

Phonetically-grounded and phonologically consistent, the assumption that /ɨ/ is a front vowel allows us also to account for an otherwise mysterious constraint on *Kɨ sequences, which is the focus of this paper. In particular, Ćavar 2007 postulated that the sequence *Kɨ is a violation of Place Agreement, requiring that a velar consonant agree with the following vowel in terms of place (coronal or dorsal). The same constraint excludes *ki sequences (as opposed to preferred /ci/, where the consonant is fronted to assimilate to the vowel)[2].

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[1] In a similar vein, Avanesov 1956 and Panov 1967: 41–43 argued that /i/ and /ɨ/ in Russian are a pair comparable to pairs of allophones of all other Russian vowels, in that members of each pair differ in exactly the same way.

[2] One of the reviewers points out that the same violation of Place Agreement arises in sequences of velar stops followed by mid front vowels, which are (synchronically) not problematic in Polish. Cavar (forthcoming) argues that Place Agreement is a family of constraints sensitive to the height of the vowel. Place Agreement referring to high vowels is higher-ranked than the general Place Agreement. Cavar argues that this universal ranking is phonetically motivated. Historically, Place Agreement also affected sequences with mid front vowels in Polish, rendering phonetic [cɛ/ɟɛ] morpheme-internally in words that nowadays have [kɛ/gɛ] (e.g., *kelner* 'waiter,' *geografia* 'geogra-

A problem of the analysis in terms of Place Agreement immediately presents itself. The constraint *Kɨ holds exceptionlessly across a morpheme boundary, but there is one morpheme-internal exception with an unclear etymology—the exclamation *a kysz!* ('go away')—and a small number of evidently new borrowings (after World War II) and/or words in learned vocabulary, such as *kynolog* and *androgyne*, which allow the sequence. To account for these apparent exceptions to *Kɨ, Ćavar (2007) postulated that /ɨ/ after a velar stop is retracted to match the velar consonant in backness.

The ultrasound study we report on in this paper sets out to phonetically test claims about the articulation of /ɨ/ in various consonantal contexts and to decide between the competing analyses of /ɨ/ as a front or as a back vowel. The paper explores the articulatory properties of Polish /ɨ/ as a function of the place of articulation of adjacent consonants (including labial /p/, coronal /t/, and velar /k/) and discusses the phonological implications of the findings. In particular, we will argue that (non-palatalized) velar stops and a default realization of /ɨ/ do not agree in backness, which underlies the constraint on *Kɨ sequences. If the sequence is produced, as happens in new borrowings, /ɨ/ needs to be modified. A retracted allophone of /ɨ/ is produced, thus assimilating to the place of articulation of the back consonant. A retraction of /ɨ/, however, should not be expected if the vowel is back. Consequently, the results support the analysis of /ɨ/ as a front vowel.

1.2. The Choice of Methodology

Articulatory data can be collected using a number of different methods, each with its own advantages and disadvantages. For Polish, older studies used palatography (Benni 1915), X-rays (Koneczna and Zawadowski 1951; Wierzchowska 1965/1971, 1980), and labiography (Dłuska 1950). A number of newer studies used electropalatography (e.g., Pompino-Marschall and Żygis 2003) and/or electromagnetic articulatography (Lorenc and Święciński 2014/2015). The latter methods enjoy excellent time resolution and thus can be used to investigate dynamic aspects of speech. On the other hand, they suffer from poor spatial coverage of the articulator surfaces. The limited number of tongue sensors (for example, three or four sensors on the tongue midline, and two sensors on the sides of the tongue blade in the study of Lorenc and Święcicki 2014/2015) give only a limited number of spatially distributed data points at any given instant in time, and the tongue surface between the sensors is not observed. Given a limited number of sensors, little information can be gathered about asymmetric articulations, and no information can be obtained

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phy.') This pronunciation could still be found into the late 20th century. Synchronically, the constraint is still active in sequences spanning a morpheme boundary.

about the tongue position behind the sensors, which limits its suitability for research targeting the tongue body and tongue root.

In contrast, research using ultrasound is well suited to show the back and root of the tongue, and the results are direct images, though their interpretation, occasionally, requires some knowledge of anatomy. Ultrasound has been used in speech research only since the 1990's, with only one earlier 2D ultrasound study of Polish by Wein et al. 1991. More generally, 2D ultrasound has by now been employed in numerous studies of a substantial number of languages and is quickly becoming a very popular method for studying articulation. The 3D-imaging we use in our study is a relative newcomer in speech research. While 2D data with equivalent spatial resolution would have better time resolution, 3D data (with time as the fourth dimension) gives more spatial information and is easier to interpret. First, it helps to verify the location of the midsagittal plane. Second, in cases when the image is of relatively poor quality, one can very often disambiguate the location of the surface of the tongue in the mid-sagittal plane by comparing images directly left and right of the mid-sagittal plane. Using 3D instead of 2D helps to avoid misinterpretation and provides additional information in cases when the articulation is not entirely symmetric along the coronal plane (left-to-right of the speaker). In our case, the use of 3D as opposed to 2D allowed us to disambiguate between retraction of the whole tongue body and a groove along the mid-sagittal plane in the same area.

2. Method

In our study, lingual articulation was imaged using a Philips EPIQ 7G ultrasound system with an xMatrix x6-1 digital 3D/4D transducer, as described by Lulich, Berkson, and de Jong 2018 and Lulich and Pearson 2019. Data were collected from 10 native speakers, five females and five males, from central and southern Poland. Participants were all speakers of standard Polish and ranged from 35 to 55 years old at the time of the recording. Seven of the speakers had lived in the United States for an extended period of time. These seven participants use Polish most of the time, paying particular attention to the quality of their language for professional or other reasons. Their Polish speech had no detectable foreign accent. Some earlier studies such as Sancier and Fowler 1997 indicate that extensive contact with a second language may impact fine phonetic details in speech. But as reported in Lulich and Cavar 2019, which made use of a complementary data set from the same 10 speakers, there were no detectable differences in vowel quality among the speakers, and this was supported by statistical analyses that showed no main effect of speaker for any of the first three formant frequencies or articulatory measures of tongue root position.

Participants were instructed to read word lists presented visually in Polish orthography, which is phonetically unambiguous. We focused on stressed vowels in disyllabic nonce words like *pypyp*, *tytyt*, *kykyk*. Nonce words like *titit*, *tetet*, *tatat*, *totot*, and *tutut* were also recorded. Additional real and nonce words were recorded as part of a larger study, but are not presented here (but see Lulich and Cavar 2019). For five speakers, the word list was read three times, resulting in three independent tokens of each of the stimuli (3 x 3 x 5 tokens with /ɨ/ + 3 x 5 x 5 tokens with other vowels = 120 tokens total). Five other speakers produced only two repetitions of each nonce word, yielding 2 x 3 x 5 tokens with /ɨ/ + 2 x 5 x 5 tokens with other vowels, or 80 tokens total. Together, a combined total of 200 tokens were analyzed.

The ultrasound transducer was secured under the chin with an Articulate Instruments ultrasound stabilization headset, see Scobbie, Wrench, and van der Linden 2008. Ultrasound files were analyzed using a custom MATLAB toolbox (The MathWorks 2018), called 'WASL', developed in the Speech Production Laboratory at Indiana University and available for download at https://spliu.sitehost.iu.edu/software/software.html. We targeted the midpoint of the vowel but due to relatively low time resolution (9.3—15.0 frames per second), with 2–4 frames for any vowel, often it was not possible to analyze the articulation exactly in the middle of the vowel, and the frame closest to the midpoint was selected. Because the vowels we investigate are monophthongs, that is, they are not expected to significantly change their quality throughout the duration of the steady-state portion and because they are articulated slowly (compared to stop consonants), the frame rates were judged to be sufficient for the present study. The appropriate frame was identified with the help of the synchronized audio spectrogram, and the midsagittal plane was verified from coronal slices of the three-dimensional ultrasound image. The shape of the tongue in the midsagittal plane was manually traced using the built-in WASL function and the tracing was copied over to a MATLAB figure for annotation. To compare the shape of the tongue across articulations, the tracings from a number of frames were copied into a single figure with the same spatial scale.

Audio recordings were made synchronously using a SHURE KSM32 microphone placed approximately one meter in front of the speaker and slightly to one side. Audio files were subsequently analyzed in Praat (Boersma and Weenink 2018) and formant frequencies were extracted using the Burg algorithm with default parameters for window length (0.025s), number of formants (4), and maximum formant frequency (3000Hz). The audio and ultrasound recordings were synchronized using the method described by Lulich, Berkson, and de Jong (2018), which has an uncertainty of about 30 ms.

For technical details about 3D/4D ultrasound in comparison with 2D ultrasound, and for details on audio synchronization, we refer the reader to Lulich, Berkson, and de Jong 2018 and Lulich and Pearson 2019. 3D/4D ultrasound has been used in phonetics/phonology research involving other languages,

e.g., Brazilian Portuguese (Charles and Lulich 2019), Korean (Hwang, Charles, and Lulich 2019), and American English (Berkson, de Jong, and Lulich 2017). Estimates and discussion of the magnitude of articulatory analysis errors (e.g., during manual segmentation of tongue surfaces) for this 3D/4D ultrasound system are given in Csapo and Lulich 2015 and Lulich, Charles, and Lulich 2017, with a maximum uncertainty of less than 0.25 cm.

3. Study Results

Before discussing the variation in articulation of /ɨ/, let us consider the place of the vowel within the larger system of Polish oral vowels. In Figure 1 on the following page, the acoustic vowel space is plotted for the /t/ context for Speaker 5. Speaker 5 imaged particularly well, and is fairly representative of the entire group of participants. Figure 1 on the following page presents a vowel inventory with three front vowels (/i, ɨ, e/) and three back vowels (/u, o, a/)[3]. The lingual articulations of all vowel phonemes in the /t/ context for Speaker 5 are represented in Figure 2 on the following page. The /i/ and /ɨ/ have more advanced tongue root and tongue body than the vowels /a/, /o/ and /u/. The vowel /e/, realized as phonetic [ɛ], has more advanced tongue root and tongue body than /o/ and /u/ but is only marginally more advanced than /a/. These data confirm that the vowel /ɨ/ is phonetically a front vowel, in terms of both acoustics and articulation.

The articulation of [ɨ] is not uniform across contexts, although the variation is systematic. Systematic differences are visible in the ultrasound images. Figure 3 (on pages 10–11) shows the tracings of the tongue surface in the mid-sagittal plane for the 10 native speakers. Speakers 1–5 produced three repetitions of the CɨCɨC nonce words, where C was /p, t, k/, and the stressed vowel[4] was traced in each repetition. Speakers 6–10 recorded two repetitions each. In order to supplement the data from Speakers 6–10, we also traced the unstressed vowel in the repetition that produced the clearest ultrasound image. We made the decision to add measurements from the unstressed vowel because the stressed and unstressed realizations of /ɨ/ were not perceptually different. Subsequent articulatory analysis supported this decision. Thus each vowel context is represented by three measurements for all 10 speakers. In Figure 3, the tongue surface during the articulation of /ɨ/ (1) between labial

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[3] Formant frequencies for all Speakers of the three high vowels (/i/, /ɨ/, /u/) are summarized in the Appendix. Formant frequencies for /i/ and /u/ are included as context for understanding the frequency ranges occupied by the formants of /ɨ/ within the larger vowel space of Polish.

[4] The default stress pattern in Polish falls on the penultimate. Speaker 3 consistently stressed the second syllable, which we traced. Other speakers stressed the penultimate syllable.
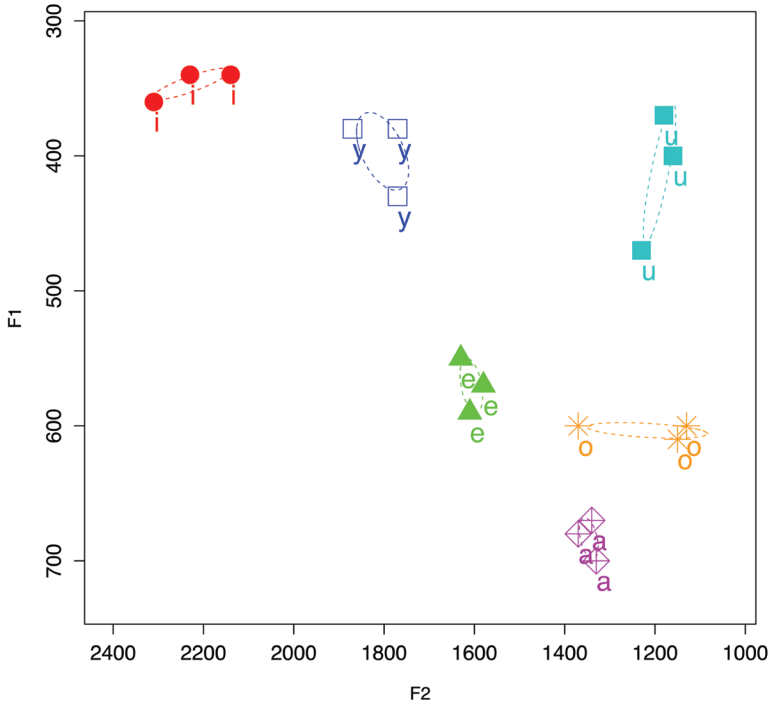
Figure 1. Vowel formant space for Polish (Speaker 5, male) in Hz. (Orthographic symbols used: "y" = [ɨ], "e" = [ɛ], "o" = [ɔ])
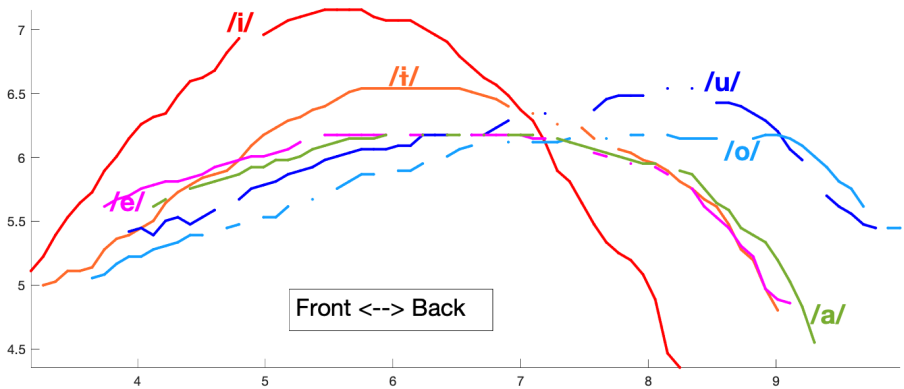
Figure 2. The lingual articulation of vowel phonemes for Speaker 5 in /t/ context.

stops is depicted in blue, (2) between coronal stops is depicted in red, and (3) between velar stops is depicted in black. The tip of the tongue points left in every case.

The results are very consistent, with all participants displaying a clear and systematic allophony. The vowel /i/ is articulated in a velar context differently than in other contexts, namely, with a greater degree of tongue body raising and a longer constriction. All ten speakers have substantially more raising in /i/ in the context of the velar stop. The constriction generally extends more posteriorly in the velar context. For all speakers except Speakers 4 and 6, the whole tongue (including the tongue root) is retracted in the velar context. For Speakers 4 and 6, increased raising results in a longer constriction extending both further to the front and further back in velar context.

The raising of the mass of the tongue has the consequence of substantially extending the length of the constriction, usually further back into the region
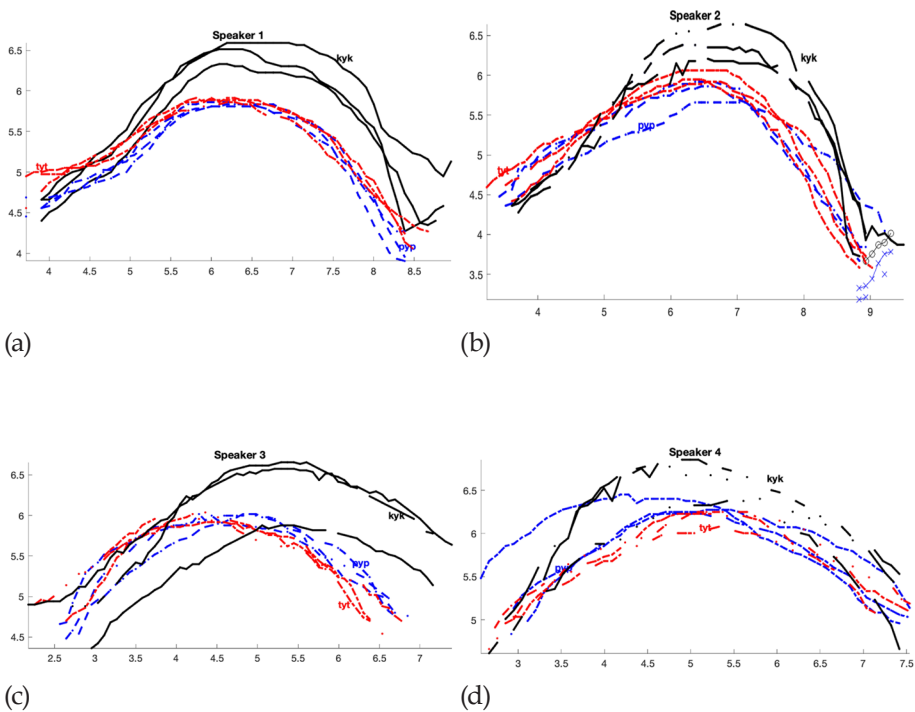
Figure 3. Mid-sagittal tongue contours for vowel /i/ in the context of /p/ (blue), in the context of /t/ (red) and in the context of /k/ (black). (a) Speaker 1 (female); (b) Speaker 2 (male); (c) Speaker 3 (female); (d) Speaker 4 (female)
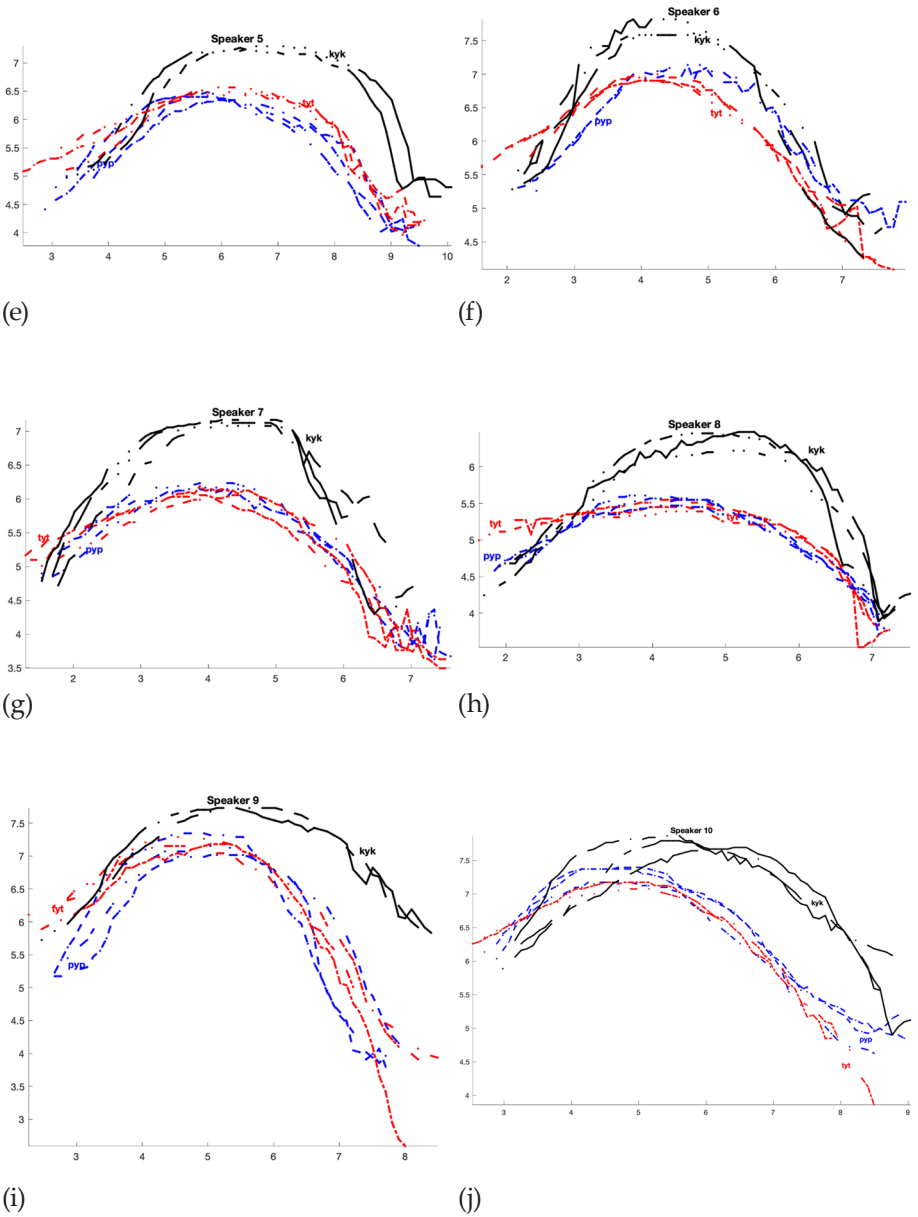
Figure 3 (cont'd). (e) Speaker 5 (male); (f) Speaker 6 (female); (g) Speaker 7 (female); (h) Speaker 8 (male); (i) Speaker 9 (male); (j) Speaker 10 (male)

of back vowels in eight of the 10 speakers. For eight of the 10 speakers, /i/ in velar context is also articulated with a clearly visible retraction of the tongue root compared to other contexts.

Preliminary analysis of other vowels produced by Speakers 7 and 9 revealed that the vowels [ɛ] and [a] are also raised in the context of the velar stops, but only /i/ is retracted (see Figure 4 on the following page for examples from Speaker 9).

4. Discussion

In the context of a velar stop, we observe the extension of the constriction for /i/ into the back vowel region without losing the constriction produced by the blade of the tongue. By being raised and retracted from its neutral position, /i/ in the context of /k/ assumes a position closer to that needed for the articulation of a velar stop. In other words, the vowel assimilates to the velar consonant. The opposite analysis, namely that of a putatively back vowel /i/ assimilating to labial and coronal consonants, is unlikely. The position of the tongue body of /i/ in the context of labial and dental stops is identical, even though labial and dental stops do not share a place of articulation, and thus we conclude that /i/ in the context of labial and dental stops shows its default value.

However, the standard assumption has thus far been that /i/ is phonologically a back vowel (Rubach 1981, 1984; Gussmann 1980, 1992, 2007; Szpyra 1995; Rydzewski 2014; Czaplicki 2013, 2019; etc.). Under this assumption, the retraction of /i/ in the context of velars is puzzling. There is no phonological justification for retracting a vowel that is already back. If we assume, on the other hand, that /i/ is a front vowel, then it appears that the neutral version of /i/, a front vowel, is not compatible with a velar stop in terms of the position on the front-back axis. The retraction can then be interpreted as a case of assimilation. We argue then that /i/ is phonologically a coronal vowel in terms of Clements and Hume's (1995) feature geometry and that in the velar consonant context it is realized also as dorsal without losing its coronal articulation, becoming a doubly-articulated segment, namely both coronal and dorsal, as shown in (2) on page 14.
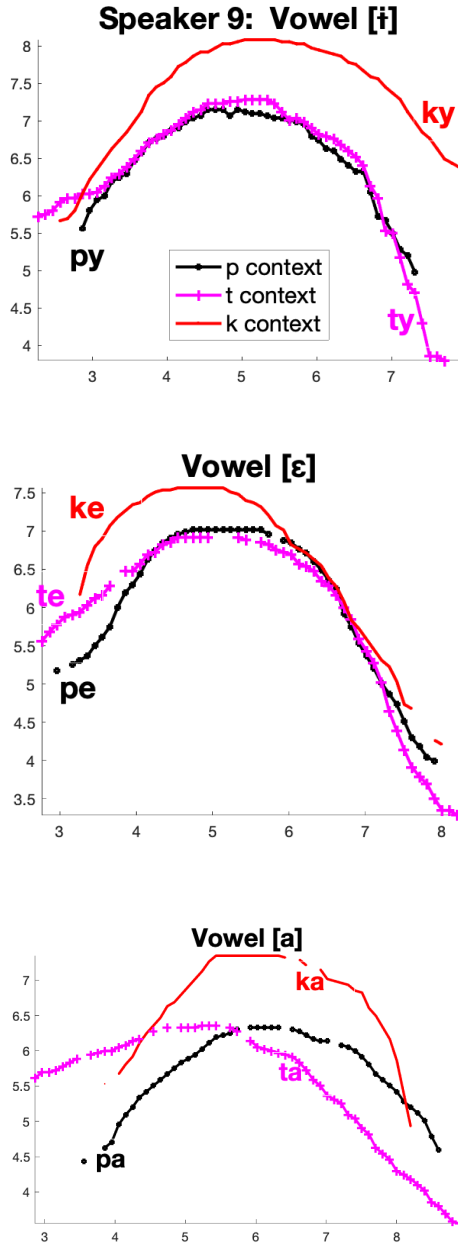
Figure 4. Mid-sagittal tongue contours for vowels /ɨ, ɛ, a/ in the context of /p/ (black squares), in the context of /t/ (pink crosses) and in the context of /k/ (red solid). Displayed data are from Speaker 9.

(2) /ɨ/-retraction
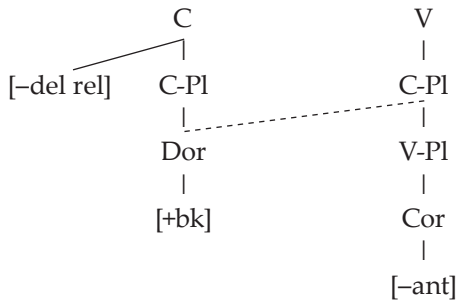
The retraction of front vowels in the context of velar stops is motivated as an assimilation through spreading of the dorsal node without delinking the coronal node. This interpretation is phonologically sound only if /ɨ/ is a front vowel. Back vowels are already dorsal and/or [+back] and they agree in specification with the velar consonant.

It is possible that the retraction is merely a result of phonetic coarticulation and thus provides no argument in support of the claim that /ɨ/ is not a back vowel (compare with the dialectal centralization of English /u/ in the context of coronal consonants, which is not a phonological process). While the analysis of English is outside of the scope of this article, we have reason to believe that the retraction of /ɨ/ repairs a phonological constraint in Polish, specifically the constraint that sequences of velar stops followed by [ɨ] cannot span a morpheme boundary and historically were excluded stem-internally (though they are now allowed in a couple of borrowings, cf. Cavar, forthcoming).

The conclusion that /ɨ/ is a front vowel begs the question about the difference between /ɨ/ and /i/. Ćavar 2007 argues that the distinction is expressed in terms of the [ATR] feature, with /i/ being [+ATR] and /ɨ/ being [–ATR]. Both phonetic and phonological arguments may be drawn in support of this position (Lulich and Cavar 2019).

If the distinction between /ɨ/ and /i/ lies in the position of the tongue root, then the interpretation of palatalization processes must be revisited. Traditionally, Polish /ɨ/ was argued not to be a front vowel—against the phonetic reality—because of the understanding that it is front vowels that trigger palatalization, and that palatalization is fronting (and perhaps also raising) of the tongue body. Polish /ɨ/ does not trigger palatalization, and so analyzing it as a front vowel like /i/ is problematic on this understanding. On the basis of prior phonological work and recent phonetic investigations (e.g., Ćavar 2007; Lulich and Cavar 2019), we propose that palatalization does not begin as a spreading of coronal but instead is initially a spreading of [+ATR]. At least since the 1970's (Lindau 1978), it has been known that [+ATR] is accompanied by passive

raising and fronting of the tongue body in vowels. We extend this observation to consonants and propose that at least some palatalization processes are represented by spreading of [+ATR] accompanied by collateral raising and fronting of the tongue body. The process, once it is phonologized, and later morphologized, may stop relying on [+ATR] entirely.

One prediction of this approach is that the vowel [ɛ], which we posit is either [–ATR] or [Ø ATR] (see Lulich and Cavar 2019), should not be able to trigger palatalization even though it is a front vowel. This holds in Polish, but Bateman (2007: 63) says explicitly that vowel such as [ɛ] can trigger palatalization in some languages. She formulates implicational universals stating that if a lower vowel (such as [ɛ]) triggers palatalization in a given language, so does a relatively higher one, e.g., [e, i] (Bateman 2007, 2011). It may be that such cases represent historically [+ATR] processes that were retained morphophonologically, even as the [+ATR] vowel trigger underwent a change to [–ATR]. That is, the phonological contrast might be phonetically reinterpreted. The association between the tongue root position and the tongue body gesture might be lost, with the phonetic contrast shifting towards assibilation and a tongue blade gesture. Morphological and lexicalized palatalizations do not need the triggering vowel to be [+ATR] (Cavar and Lulich 2018).

If /ɨ/ is a front vowel like /i/, arguments referring to the combinability of these vowels with posterior consonants in Polish need to be reinterpreted. Hard posteriors—transcribed differently by different sources as [ʂ, ʐ, t͡ʂ, d͡ʐ] (e.g., Hamann 2003), [ʃ, ʒ, t͡ʃ, d͡ʒ] (e.g., Dogil 1990), [s̠, z̠ ts̠, dz̠] (Ladefoged and Disner 2012: 169; Mihajlović and Cavar 2018), or [š, ž, tš, dž] in the Slavic linguistic tradition—combine with /ɨ/ but only to a limited extent with /i/, cf. the discussion in Hamann 2003. The distributional constraints are often presented as an incompatibility in terms of frontness. However, if /ɨ/ is a front vowel, we cannot capture the incompatibility of Polish hard posteriors with [i] in terms of frontness. On both phonetic and phonological grounds, we have proposed that this incompatibility is in terms of [ATR] (Ćavar 2007; Lulich and Cavar 2019).

The question remains whether velar fricatives trigger allophonic variation in /ɨ/ like the velar stops. This study has not examined the effects of velar fricatives on /ɨ/ articulation or acoustics. The phonotactic constraints prohibiting *Kɨ sequences—as described in Section 1—pertain only to velar stops; xɨ-sequences are allowed in Polish, both morpheme-internally and across a morpheme boundary. It is therefore doubtful that the articulatory allophony of /ɨ/ observed in the present study should also be triggered by velar fricatives. Exceptional behavior in the context of stops but not fricatives is not surprising. From the articulatory point of view, stop consonants generate a tighter constriction and might thus induce a stronger need for coarticulation than fricatives. An analysis within the framework of Optimality Theory could capture the issue of violations that exclude *Kɨ but not xɨ, with the dispreferred

(i.e., non-assimilated) form being excluded only during a very tight constriction. However, to unambiguously answer such questions, further instrumental research is necessary.

5. Conclusions

This paper describes allophonic variation in the articulation of the Polish vowel /ɨ/ depending on the place of articulation of the preceding stop consonant. For the labial and dental stop context, we propose that the back of the tongue is in neutral position, while in the velar stop context the tongue is raised and the constriction extends further into the back vowel region. Although this study has broad implications for understanding palatalization, its most striking and direct consequence for the interpretation of the phonological system of Polish is that the neutral /ɨ/ (outside of the velar stop context) is articulatorily incompatible with a dorsal articulation, and it thus provides new support for the claim that Polish /ɨ/ is a front vowel. The retraction of /ɨ/ in the context of velar stops is assimilatory and serves as an argument in support of the analysis of /ɨ/ as a front vowel.

References

Archangeli, Diana and Douglas Pulleyblank. (1994) *Grounded phonology*. Cambridge, MA: MIT Press.

Avanesov, Ruben Ivanovich. (1956) *Fonetika sovremennogo russkogo jazyka*. Moscow: Izdatel'stvo Moskovskogo universiteta.

Avanesov, Ruben Ivanovich and Vladimir Nikolaevich Sidorov. (1945) *Očerk grammatiki russkogo literaturnogo jazyka*. Vol. 1: *Fonetika i fonologija*. Moscow: Gosudarstvennoe učebno-pedagogičeskoe izdatel'stvo.

Bateman, Nicoleta. (2007) *A crosslinguistic investigation of palatalization*. Ph.D. dissertation, University of California, San Diego.

———. (2011) "On the typology of palatalization". *Language and linguistics compass* 5(8): 588–602.

Benni, Tytus. (1915) "Fonetyka opisowa". *Encyklopedia polska*. Dział III: *Język polski i jego historia z uwzględnieniem innych języków na ziemiach polskich*. Cracow: Gebethner i Ska.

Berkson, Kelly H., Kenneth de Jong, and Steven M. Lulich. (2017) "Three-dimensional ultrasound imaging of pre- and post-vocalic liquid consonants in American English: Preliminary observations". *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, New Orleans, LA, 2017, 5080–84. Available at: https://ieeexplore.ieee.org/document/7953124.

Blevins, Juliette and Andrew Garrett. (2004) "The evolution of metathesis". Bruce Hayes, Robert Kirchner, and Donca Steriade, eds. *Phonetically-based phonology*. Cambridge, UK: Cambridge University Press, 117–56.

Boersma, Paul. (1998) *Functional phonology*: *Formalizing the interactions between articulatory and perceptual drives*. The Hague: Holland Academic Graphics.

Boersma, Paul and David Weenink. (2018) *Praat: Doing phonetics by computer* [computer program]. Available at: http://www.praat.org/.

Ćavar, Małgorzata E. (2007) "[ATR] in Polish". *Journal of Slavic linguistics* 15(2): 207–28.

————. (forthcoming) "Phonetics explains phonotactics. On velar consonants followed by front vowels in Polish". *Proceedings of Approaches to Phonology and Phonetics, Lublin 2019.*

Cavar, Małgorzata E. and Steven M. Lulich. (2018) "The position of the tongue root in the articulation of posterior sibilants in Polish". *The journal of the Acoustical Society of America* 143(3): 1967–67. Available at: https://doi.org/10.1121/1.5036471.

Charles, Sherman and Steven M. Lulich. (2019) "Articulatory-acoustic relations in the production of alveolar and palatal lateral sounds in Brazilian Portuguese". *The journal of the Acoustical Society of America* 145(6): 3269–88. Available at: https://doi.org/10.1121/1.5109565

Chomsky, Noam and Morris Halle. (1968) *The sound pattern of English*. New York: Harper and Row.

Clements, George N. and Elizabeth V. Hume. (1995) "The internal organization of speech sounds". John Goldsmith, ed. *The handbook of phonological theory*. Cambridge, MA and Oxford: Blackwell, 245–307.

Csapó, Tamás Gábor and Steven M. Lulich. (2015) "Error analysis of extracted tongue contours from 2D ultrasound images". *INTERSPEECH-2015*: 2157–61. Available at: http://www.isca-speech.org/archive/interspeech_2015/i15_2157.html.

Czaplicki, Bartłomiej. (2013) "Arbitrariness in grammar: Palatalization effects in Polish". *Lingua* 123: 31–57.

————. (2019) "Measuring the phonological (un)naturalness of selected alternation patterns in Polish". *Language sciences* 72: 160–87.

Dłuska, Maria. (1950) *Fonetyka polska*: *Artykulacje głosek polskich*. Warsaw: Wydawnictwo Studium Słowiańskiego.

Dogil, Grzegorz. (1990) "Hissing and hushing fricatives: A comment on nonanterior spirants in Polish". Unpublished ms., Universität Bielefeld, Bielefeld, Germany.

Flemming, Edward. (1995) *Auditory representations in phonology*. Ph.D. dissertation, University of California, Los Angeles.

————. (2001) "Scalar and categorical phenomena in a unified model of phonetics and phonology". *Phonology* 18(1): 7–44.

Gussmann, Edmund. (1980) *Studies in abstract phonology*. Cambridge, MA: MIT Press.

————. (1992) "Back to front: Non-linear palatalization in Polish". Jacek Fisiak and Stanisław Puppel, eds. *Phonological investigations*. Amsterdam: John Benjamins Publishing Company.

————. (2007) *The phonology of Polish*. Oxford: Oxford University Press.

Halle, Morris. (1983) "On distinctive features and their articulatory implementation". *Natural language and linguistic theory* 1(1): 91–105.

Hamann, Silke. (2003) *The phonetics and phonology of retroflexes*. Ph.D. dissertation, Utrecht University.

Hayes, Bruce. (2009) *Introductory phonology*. Hoboken, NJ: Wiley-Blackwell.

Hayes, Bruce and Donca Steriade. (2004) "Introduction: The phonetic basis of phonological Markedness". Bruce Hayes, Robert Kirchner, and Donca Steriade, eds. *Phonetically-based phonology*. Cambridge: Cambridge University Press, 1–33.

Hwang, Young, Sherman Charles, and Steven M. Lulich. (2019) "Articulatory characteristics and variation of Korean laterals". *Phonetics and speech sciences* 11(1): 19–27.

Jakobson, Roman and Morris Halle. (1956) *Fundamentals of language*. The Hague: Mouton.

Kager, René. (1999) *Optimality theory*. Cambridge: Cambridge University Press.

Koneczna, Halina and Wiktor Zawadowski. (1951) *Przekroje rentgenograficzne głosek polskich*. Warsaw: PWN.

Ladefoged, Peter and Sandra Disner. (2012) *Vowels and consonants*. 3rd Edition. Hoboken, NJ: Wiley-Blackwell.

Lindau, Mona E. (1978) "Vowel features". *Language* 54(3): 541–63.

Lorenc, Anita and Radosław Święciński. (2014/2015) "Articulatory studies of the Polish sound system". *Logopedia* 43/44: 61–82.

Lulich, Steven M., Sherman Charles, and Benjamin Lulich. (2017) "The relation between tongue shape and pitch in clarinet playing using ultrasound measurements". *The Journal of the Acoustical Society of America*. 141: 1759–68. Available at: https://doi.org/10.1121/1.5127834

Lulich, Steven M., Kelly Berkson, and Kenneth de Jong. (2018) "Acquiring and visualizing 3D/4D ultrasound recordings of tongue motion". *Journal of phonetics*. 71: 410–24. Available at: https://doi.org/10.1016/j.wocn.2018.10.001

Lulich, Steven M. and Małgorzata Cavar. (2019) "Phonetics of Polish 'soft'-'hard' vowel allophony". *The Journal of the Acoustical Society of America*. 146(4): 2263–78. Available at: https://doi.org/10.1121/1.5127834

Lulich, Steven M. and William G. Pearson Jr. (2019) "3D/4D ultrasound technology in speech research". *Perspectives of the ASHA Special Interest Groups 4*: 733–47. Available at: https://pubs.asha.org/doi/abs/10.1044/2019_PERSSIG19-2019-0001.

Mihajlović, Kristina and Małgorzata E. Cavar. (2018) "Perception of Croatian/Bosnian/Serbian sibilants: Heritage U.S. vs. homeland speakers. A pilot study". Denisa Lenertová, Roland Meyer, Radek Šimík, and Luka Szucsich, eds., *Advances in formal Slavic linguistics 2016*. Berlin: Language Science Press, 265–88.

Panov, Mikhail V. (1967) *Russkaja fonetika*. Moscow: Prosveščenie.

Pater, Joe. (1999) "Austronasian nasal substitution and other NC effects". Harry van der Hulst, René Kager, and Wim Zonneveld, eds. *The prosody-morphology interface*. Cambridge: Cambridge University Press, 310–43.

Pompino-Marschall, Bernd and Marzena Żygis. (2003) "Surface palatalization of Polish bilabial stops: Articulation and acoustics". Maria-Josep Solé, Daniel Recasens, and Joaquin Romero, eds. *Proceedings of the 15th International Congress of Phonetic Sciences*. Barcelona: Universitat Autònoma de Barcelona, 1751–54.

Rubach, Jerzy. (1981) *Cyclic phonology and palatalization in Polish and English*. Warsaw: Wydawnictwa Uniwersytetu Warszawskiego.

———. (1984) *Cyclic and lexical phonology*: *The structure of Polish*. Dordrecht: Foris.

Rydzewski, Paweł. (2014) *Phonological consequences of the backness distinction in high vowels with reference to selected Slavic languages from the perspective of current American phonological theories*. Ph.D. dissertation, University of Warsaw.

———. (2017) *Backness distinction in phonology: A Polish perspective on the phonemic status of «y»* [Łódź Studies in Language]. Berlin: Peter Lang.

Sancier, Michele L. and Carol A. Fowler. (1997) "Gestural drift in a bilingual speaker of Brazilian Portuguese and English". *Journal of phonetics* 25(4): 421–36

Sawicka, Irena. (1995) *Fonologia*. Henryk Wróbel, ed. *Fonetyka i fonologia*. Cracow: Wydawnictwo Instytutu Języka Polskiego PAN, 107–98.

Scobbie, James M., Alan Wrench, and Marietta van der Linden. (2008) "Head-probe stabilisation in ultrasound tongue imaging using a headset to permit natural head movement". Rudolph Sock, Susanne Fuchs, and Yves Laprie, eds. *Proceedings of the 8th International Seminar on Speech Production*. Strasbourg: INRIA, 373–76.

Stampe, David. (1973) *A dissertation on natural phonology*. Ph.D. dissertation, University of Chicago.

Steriade, Donca. (2008) "The phonology of perceptibility effects: The P-map and its consequences for constraint organization". Kristin Hanson and Sharon Inkelas, eds. *The nature of the word: Studies in honor of Paul Kiparsky*. Cambridge, MA: MIT Press, 151–79.

Szpyra, Jolanta. (1995) *Three tiers in Polish and English phonology*. Lublin: Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej.

The MathWorks. (2018) MATLAB. Available at: https://www.mathworks.com.

Wein, Bethold, Rajmund Böchler, Stanisław Klajman, and Andrzej Obrębowski. (1991) "Ultrasonografia języka w rehabilitacji zaburzeń artykulacyjnych". *Otolaryngologia polska* 45(2): 133–39.

Wierzchowska, Bożena. (1965/1971) *Wymowa polska*. Warsaw: Państwowe Zakłady Wydawnictw Szkolnych.

———. (1980) *Fonetyka i fonologia języka polskiego*. Wrocław: Zakład Narodowy im. Ossolińskich—Wydawnictwo PAN.

Wiśniewski, Marek. (1997) *Zarys fonetyki i fonologii współczesnego języka polskiego*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

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Appendix

Sample formant values (in Hz), in the contexts of /ɕ/ for /i/ and in the context of /t/ for all other vowels, Speakers 1–10):

	S01 F	S02 M	S03 F	S04 F	S05 M	S06 F	S07 F	S08 M	S09 M	S10 M
[i]										
F3	3222	2936	3020	3288	2635	3480	3184	2444	3152	2529
F2	2602	2020	2252	1750	2039	2612	2566	2150	2020	1925
F1	470	290	403	287	304	480	354	455	384	380
[ɨ]										
F3	3131	2383	2717	2916	2302	2865	2779	2515	2578	2379
F2	2232	1942	1822	1889	1716	1784	1908	1846	1807	1758
F1	553	358	410	475	377	461	434	511	375	394
[u]										
F3	3051	2473			2409	2920	2897	2042	2315	2359
F2	1105	1155			1070	1221	1016	1046	823	1035
F1	353	316			379	483	444	491	388	408
[ɛ]										
F3	3326	2217	2798	2936	2319	2965	2774	2503	2384	2217
F2	2126	169	1709	1988	1513	1723	1805	1735	1714	1507
F1	758	562	529	715	564	560	725	511	448	486
[ɔ]										
F3	3277	2993	2815	2796	2173	3101	2750	2501	2778	2506
F2	1061	1170	1168	1343	1200	1358	1212	1184	839	1003
F1	676	575	574	676	577	661	760	596	478	559
[a]										
F3	2700	2181	2752	2888	2285	3040	2697	2552	2556	2302
F2	1406	1354	1479	1597	1361	1587	1435	1427	1233	1266
F1	934	630	722	912	679	934	906	821	633	605

How Incremental is the Processing of Perfective and Imperfective Aspect in Polish? An Exploratory Event-Related Potential Study

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Abstract: The present paper reports two ERP experiments in Polish that examined the processing of mismatches between perfective and imperfective verbs and temporal modifiers, which preceded the VP (Experiment 1) and followed it (Experiment 2). The mismatch between perfective verb and a preceding durative adverbial elicited an N400 on the object. No ERP effect was found for the analogous mismatch between imperfective verbs and a preceding time-span adverbial. The mismatching temporal adverbial elicited an early positivity (potentially an early P600) when it followed a perfective VP and a LAN when it followed an imperfective VP. The results suggest that: (i) the domain of aspectual interpretation in Polish is a VP; (ii) mismatches with perfective and imperfective verbs are resolved differently depending on the degree of their semantic specificity (only semantically underspecified imperfective verbs can be easily adjusted to the requirements of the preceding context); (iii) the position of the temporal adverbial plays a role in that a preverbal adverbial sets up a frame within which the eventuality should be interpreted and the aspectual value computed on AspP can be potentially adjusted to it (semantic integration reflected in N400), whereas a postverbal adverbial must agree with the aspectual value already computed on AspP (syntactic integration reflected in an early positivity or a LAN).

1. Introduction

While in theoretical linguistics a lot of attention has been paid to the category of aspect and its interpretation, it is only recently that the topic of how aspect is interpreted has attracted the attention of psycholinguists, and only very few psycholinguistic studies have been devoted to the processing of grammatical aspect in Slavic languages. The existing psycholinguistic studies related to the processing of aspect have focused mainly on the mechanisms involved in the resolution of aspectual mismatches in English and German (see, among others, Piñango, Zurif, and Jackendoff 1999; Todorova et al. 2000; Pickering et al. 2006; Piñango et al. 2006; Bott 2010; Brennan and Pylkkänen 2010; Paczynski, Jackendoff, and Kupenberg 2014; Husband and Stockall 2015). More recently, Bott and Gattnar (2015) conducted two eye-tracking experiments in which they investigated the processing of sentences with aspectual mismatches involving

transitive achievement verbs (e.g., *win*, *spot*, *reach*) and durative *for X-time* adverbials in German (a non-aspect language) and in Russian (an aspect language). They showed that Russian readers immediately noticed the mismatch on the verbal region when a mismatching adverb preceded it, whereas German readers reacted to an analogous mismatch on the object. On the basis of this observation, they concluded that if a language has the grammatical means to express an aspectual distinction, the processor immediately commits to an aspectual interpretation (Bott and Hamm 2014, as quoted in Bott and Gattnar 2015: 6). This generalization is compatible with Filip and Rothstein's (2006) telicity parameter, according to which telic meaning is composed at the level of V in Russian and at the level of VP in English, and with Rothstein's (2015) broader generalization according to which there is a parametric difference between Russian (and potentially other Slavic languages) and English (and potentially other Germanic languages) aspectual systems in that in English aspectual operators operate at the VP level while in Russian they operate on the V. A different approach to the issue of incrementality of aspectual interpretation was presented by Husband and Stockall (2015). They argue that the composition of aspectual meaning proceeds cross-linguistically in two stages: first the verb and its direct object form the VP and then AspP is generated above it. In other words, the incremental commitment to aspectual interpretation is made once the full VP is formed and leads to the generation of a higher functional projection, AspP, where aspect is computed. They postulate that even when a verb has unambiguous event semantics, the commitment to an aspectual interpretation is made after the full VP has been processed. This shows that the question related to the domain over which the parser computes aspectual meanings is relevant but still under debate. For this reason, further studies using additional data from different languages are necessary. In order to further contribute to the discussion on the incrementality of aspectual interpretation, we will report two Event Related Potentials (ERP) experiments focusing on how the brain reacts online when it detects an aspectual mismatch in Polish, a language in which verbs are obligatorily specified as perfective or imperfective. In the reported experiments we contrasted contexts with perfective and imperfective accomplishment verbs with matching and mismatching temporal adverbials, that is, time span ('in X-time') and durative ('for X-time') adverbials. Additionally, in order to learn more about the timing of aspectual composition, we manipulated the word order. The matching and mismatching adverbials preceded the verb and its complement in Experiment 1 and they followed the verb and its complement in Experiment 2, as shown in (1a) and (1b) and (2a) and (2b) respectively.[1] In examples (1a) and (2a) perfective verbs (describing bounded eventualities) are compatible with time

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[1] The symbol # is used to signal that this sentence is acceptable (on a less salient reading), but deviant at the first pass.

span and incompatible with durative adverbials. By contrast, in (1b) and (2b) imperfective verbs (describing unbounded eventualities) are compatible with durative adverbials and incompatible with time span adverbials.

(1) a.   ✓ 'in X-time' + perfective

    ✓**W minutę** / *Przez minutę cichutko **otworzył**   zamek,
    in minute /   for minute   quietly   open$_{PFV.PST.3SG.M}$ lock$_{ACC}$

    żeby   nie obudzić   żony.
    in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

    'He silently opened the lock in a minute in order not to wake up his wife.'

   b.   ✓ 'for X-time' + imperfective

    $^{\#}$**W minutę** / ✓Przez minutę cichutko **otwierał**   zamek,
    in minute /   for minute   quietly   open$_{IPFV.PST.3SG.M}$ lock$_{ACC}$

    żeby   nie obudzić   żony.
    in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

    'He was silently opening the lock for a minute in order not to wake up his wife.'

(2) a.   ✓ perfective + 'in X-time'

    Cichutko **otworzył**   zamek ✓**w minutę** / $^{\#}$przez minutę,
    quietly   open$_{PFV.PST.3SG.M}$ lock$_{ACC}$ in minute / for minute

    żeby   nie obudzić   żony.
    in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

    'He silently opened the lock in a minute in order not to wake up his wife.'

   b.   ✓ imperfective '+ for X-time'

    Cichutko **otwierał**   zamek $^{\#}$**w minutę** / ✓przez minutę,
    quietly   open$_{IPFV.PST.3SG.M}$ lock$_{ACC}$ in minute / for minute

    żeby   nie obudzić   żony.
    in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

    'He was silently opening the lock for a minute in order not to wake up his wife.'

There are three research questions in the reported study: (i) Does the degree of semantic specificity of grammatical aspect (perfective being specific and imperfective being underspecified) play a role in the online processing? (ii) Is the domain of interpretation of grammatical aspect in Polish a V or a VP? (iii)

Does the resolution of mismatches between grammatical aspect and temporal adverbials depend on the (preverbal or postverbal) position of the latter? Regarding the first question, we expect that due to the differences in the semantic specificity, the mismatches with perfective aspect and imperfective verbs will either lead to different ERP signatures or alternatively to the same ERP signatures but with a stronger amplitude in the case of perfective condition. Concerning the second question, we expect that if the domain of aspectual interpretation is the verb, the ERP effects in mismatching conditions with a preverbal adverbial should be visible on the verb, or alternatively, if the domain of aspectual interpretation is VP, the effect should be visible on the object. Finally, regarding the third question, given that the sentence-initial adverbial sets up a frame for the aspectual interpretation, we might expect problems with semantics at discourse level integration on the following mismatching region. By contrast, when the mismatching adverbial follows the VP, we might expect difficulties with syntactic integration, since in this case the temporal adverbial must match the aspectual value already computed at the level of AspP.

The present paper has the following organization. First, in Section 2 we provide relevant descriptive facts about Polish aspect including some facts related to the differences in the semantic status of perfective and imperfective aspect and their interaction with temporal adverbials. Then, in Section 3 we provide brief overview of different approaches proposed in the literature pertaining to the question of the time course of aspectual interpretation and possible cross-linguistic differences regarding the size of the domain relevant for event interpretation. This part will be relevant for the formulation of our predictions regarding the question of incrementality of perfective and imperfective aspectual interpretation. In order to be able to formulate more precise predictions as to the expected ERP signatures, we will first, in Section 4.1., briefly characterize the ERP method and relevant ERP components and then in Section 4.2. we will review recent psycholinguistic ERP findings pertaining to the question of how the brain reacts when it detects aspectual mismatches. With the relevant background provided, we will formulate our predictions and provide the description of the present study (including an online acceptability rating questionnaire and ERP experiments) and the results in Sections 5.1. and 5.2. respectively. Section 6 will conclude the paper and suggest possible avenues for further research.

2. Aspect

2.1. General Remarks on Aspect

One of the standard assumptions about the computation of temporal/aspectual meanings is that tense scopes over grammatical aspect, which in turn

scopes over the lexical eventuality description of a verbal predicate, as schematically represented by means of de Swart's (1998: 348) model of aspectual composition in (3):

(3) $[_{TP}$ TENSE $[_{AspP}$ ASPECT* $[_{VP}$ $[_{V}$ EVENTUALITY DESCRIPTION]]]]^2

In languages that do not possess a wide range of grammatical aspectual morphemes, aspectual meaning is computed mainly based on lexical aspect corresponding to the lowest layer in de Swart's model. By contrast, in languages that possess grammatical aspect (the aspect layer in de Swart's model) aspectual meaning is composed based on the interaction between lexical aspect (aspectual class) and the language-specific semantics of grammatical aspectual markers (typically manifested in the form of perfective and imperfective or progressive morphology) (see Comrie 1976; Dahl 1985; Binnick 1991; Smith 1997; Croft 2003). In this model, perfective and imperfective aspectual operators would act as eventuality description modifiers. One of the differences between perfective and imperfective aspect that most scholars postulate is that imperfective aspect involves a temporal perspective that falls inside an event which in turn excludes the event endpoints from view, whereas perfective aspect involves a temporal perspective that locates the temporal trace of an event within the reference time (see also Reichenbach 1947; Comrie 1976; Kamp and Reyle 1993; Klein 1994; Smith 1997; Kratzer 1998; Borik 2002; Kazanina and Phillips 2003). There are also scholars who say that only perfective aspect is a true aspectual operator and imperfective aspect is a non-aspect whose meaning is semantically underspecified (Paslawska and von Stechow 2003; Hacquard 2006; Willim 2006; Filip 2017). This already suggests that we should expect different ways of resolving mismatches with perfective and imperfective aspect resulting from their different degrees of semantic specificity.

2.2. Grammatical Aspect in Polish—Basic Facts[3]

In Polish, almost all verbs[4] (including infinitives) are either perfective or imperfective, see the examples in (1a) and (1b) for illustration. Additionally, most verbs in Polish have both perfective and imperfective variants.

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[2] The Kleene star * indicates that there may be more aspectual operators.

[3] For a more detailed presentation of the grammatical aspect in Polish, see Klimek-Jankowska, Czypionka, Witkowski, and Błaszczak (2018), on which this section is based.

[4] With the exception of biaspectual verbs such as, for example, *anulować* 'to cancel' and *aresztować* 'to arrest'.

2.2.1. Perfective Aspect

Most perfective verbs pass a couple of standard tests used to diagnose perfectivity in Polish, as well as most Slavic languages (see Zinova 2016 for a detailed discussion). More specifically, what most perfective forms have in common is that they cannot be used as complements of phasal verbs: *zacząć* 'to begin', *kontynuować* 'continue', *skończyć* 'to finish', or as complements of the auxiliary *będzie* in periphrastic future constructions, as shown in (4) (cf. Wróbel 2001; Willim 2006; Filip 2017):

(4)   zacząć/kontynuować/skończyć/będzie   'to begin/continue/finish/will'

✓czytać$_{IPFV}$ / *przeczytać$_{PFV}$ artykuł 'read/finish reading an article'

✓kwiczeć$_{IPFV}$ / *zakwiczeć$_{PFV}$ 'squeak repeatedly/start squeaking'

✓śpiewać$_{IPFV}$ / *pośpiewać$_{PFV}$ 'sing/sing for a while'

✓stukać$_{IPFV}$ / *stuknąć$_{PFV}$ 'knock repeatedly/knock once'

Furthermore, most perfective verbs do not form a present participle *przeczytając* 'while reading', *stuknąc* 'while knocking', *poczytając* 'while reading'. The present tense form of perfective verbs always makes reference to a future event as in *przeczyta* '(he/she) will read', *pośpiewa* '(he/she)will sing for a while' (see Filip 2017: 173).

Most Polish perfective verbs are morphologically marked by means of a prefix or a suffix, which are marked in italics in (5a,b) respectively (cf. Bogusławski 1963; Nagórko 1998; Wróbel 1999, 2001; Willim 2006) but there is no single dedicated perfective or imperfective morphological marker in Polish.

(5)   a.   pisać$_{IPFV}$ — *na*pisać$_{PFV}$ 'to write'
       b.   błyskać$_{IPFV}$ — błys*ną*ć$_{PFV}$ 'to flash'

In spite of the fact that the class of perfective verbs is not uniform—there are final boundary perfectives, initial boundary perfectives, delimitative perfectives, and semelfactive perfectives—perfectives in Polish have individuation boundaries and they are used to refer to a single, well-delimited event occurring on a specific occasion, as postulated in Willim 2006 and Filip 2017. According to Laskowski (1984: 164), the prevailing function of perfective aspect is to focus on the transition between an action described by the verbal predicate and a result state.

2.2.2. Imperfective Aspect

Imperfective verbs form two classes: primary imperfectives ('unprefixed' verbs, see (6a), (7a)) and secondary imperfectives usually signaled by the presence of an *-ywa-* suffix and its allomorphs or by stem alternation (see (6b), (7b)).

(6) a.   pisać$_{IPFV}$ 'to write'

 b.   podpis*ywa*ć$_{IPFV}$ 'to sign'

(7) a.   bić$_{IPFV}$ 'to hit'

 b.   wbi*ja*ć$_{IPFV}$ 'to hammer'

In contrast to perfective verbs, imperfective verbs pass all the tests mentioned in Section 2.2.1. More precisely, they can be used as complements of phasal verbs and of the auxiliary *będzie* in periphrastic future constructions (see (4)) and they form present participles *czytając* 'while reading', *śpiewając* 'while singing'. Imperfective verbs in Polish are consistent with several readings and depending on context can refer to progressive, iterative, habitual, completed, and even resultative eventualities. In that sense imperfective verbs are semantically underspecified (see Wierzbicka 1967; Comrie 1976; Filip 1993/1999; Smith 1997; and Willim 2006; among others, for further discussion).

It has been pointed out that the basic reading of imperfective aspect is progressive as in, *Anna czytała$_{IPFV}$ gazetę, kiedy ktoś wszedł$_{PFV}$ do domu. Przerwała na chwilę, rozglądnęła się i nadal czytała$_{IPFV}$.* 'Anna read$_{IPFV}$ (lit., was reading) a newspaper when someone entered the house. She stopped reading for a moment, looked around and kept on reading.' (see Laskowski 1984; Padučeva 1996). On this reading the initial and final boundaries of the event denoted by the imperfective verb are not included in the reference time, and the imperfective verb refers to an event that is incomplete at the asserted interval (see Willim 2006: 200–201). However, it should be noted that the frequency of the various uses of imperfective verbs may depend on the semantics of the individual verb and on the context.[5] As stated in Laskowski 1984, the main function of imperfective verbs is to focus on the action.

Another reading of imperfective verbs is the plural-event reading. On this reading, an imperfective verb in Polish may refer to a series of delimited events repeated over an interval on a single occasion, e.g., *Jan pukał$_{IPFV}$ do drzwi przez pięć minut* 'Jan knocked$_{IPFV}$ (lit., was knocking) at the door for five minutes' or on several occasions, as in, for example, *Sąsiad podlewał ogród wieczorami* 'The neighbour watered$_{IPFV}$ the garden in the evening'. The latter type of plural-event reading of imperfective verbs is used to describe events

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[5] We would like to thank a reviewer for pointing this out.

repeated over a longer stretch of time on several separate occasions by virtue of one's habits, duties, and/or disposition.[6]

2.2.3. Aspect and Temporal Modifiers

As mentioned above, Laskowski (1984: 164) states that the main function of perfective aspect is to focus on the transition between an action described by the verbal predicate and a result state, while the imperfective aspect focuses on the action itself. Both perfective and imperfective verbs can co-occur with temporal adverbials anchoring an event within the time axis (e.g., *Jan jadł/zjadł zupę o piątek* 'Jan was eating/Jan ate soup at five o'clock') with a different meaning effect. When an imperfective verb is used with an anchoring temporal adverbial, the meaning is that the action itself occurs at this point. By contrast, when perfective is used with an anchoring temporal adverbial, the meaning is that the transition between the action and its result state takes place at this point.

Regarding other temporal adverbials such as durative ('for X time') and time span ('in X-time') adverbials, the former are most compatible with imperfective verbs and the latter with perfective verbs. As stated in Laskowski 1984, the imperfective (in its single ongoing use) focuses on the action and hence can be modified by an adverbial that specifies its duration. On the other hand, the perfective focuses on the transition from the action to a result state and hence can be modified by an adverbial describing the amount of time needed for the transition. There are some exceptional perfective verbs such as, for example, the delimitative ones (*Marek posiedział godzinę w kawiarni* 'Marek sat$_{PFV}$ one hour in the café', *Janek przetańczył całą noc* 'Janek danced$_{PFV}$ the whole night through', or the saturative ones *Zosia napatrzyła się na wiele różnych sytuacji przez ostatnich pięć lat* 'Zosia had$_{PFV}$ her fill of different situations in the last five years', which are compatible with durative adverbials because here perfectivity does not mark a transition from an action to its result state but it temporally delimits the action.

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[6] Imperfective verbs in Polish can also be used to talk about events that are planned or that are about to happen but have not started yet as in *Zaraz wysiadam$_{IPFV}$ z pociągu* 'I am getting off the train in a moment' (see Błaszczak and Klimek-Jankowska 2013 for further discussion), and as observed in Śmiech 1971: 44, Szwedek 1998: 414–15, and Willim 2006: 201–02, among others, imperfective aspect in Polish can also be used to talk about culminated events in special contexts in which the culmination is a matter of the so called telic presupposition or factivity as in *Kto gotował$_{IPFV}$ te ziemniaki?* 'Who cooked these potatoes?' (see also Grønn 2003; Altshuler 2012).

2.3. Asymmetries Between Perfective and Imperfective Aspect

In Polish and in most languages that manifest the distinction between perfective and imperfective aspect, the former is semantically more specific and has a more constrained distribution and the latter has a wider, more general meaning and occurs in a wider set of contexts. For the present paper it is important to note the difference between imperfective and perfective aspect as concerns incongruent combinations with a time span and a durative adverbial respectively.

In Section 2.2.2. we pointed out that imperfective aspect can have different interpretations, e.g., progressive (episodic ongoing), habitual, or iterative. As emphasized by Laskowski (1984: 170–71), while imperfective verbs do not allow for the modification by a time span adverbial in their single ongoing meaning, they are compatible with such adverbials under the plural event reading (where the time span adverbial describes the time needed to reach a transition point for each single event of the series of events). Consider (8).

(8) Maria gotowała   obiad   w godzinę.
     Maria cook$_{IPFV.PST.3SG.F}$ dinner in hour

     [Impossible] 'Maria was cooking dinner in an hour (on a single occasion).'

     'Maria cooked dinner in an hour (on several occasions).'

The spontaneous reaction to (8) is that it is deviant, as confirmed in the acceptability rating study described in Section 5.1. However with some effort it is possible to arrive at its secondary habitual interpretation, as indicated in the translation of (8) above.[7]

What is relevant in the context of the present study is the observation that while the mismatch between the imperfective verb and a time span adverbial can be resolved under the habitual interpretation, the mismatch between a perfective verb (being semantically very specific) and a durative adverbial cannot be resolved. Consider (9).

(9) *Maria ugotowała   obiad   przez godzinę.
      Maria cook$_{PFV.PST.3SG.F}$ dinner in   hour

     [Intended] 'Maria cooked$_{PFV}$ dinner for an hour.'

     [Intended] 'Maria finished cooking dinner for an hour.'

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[7] In that sense, imperfective aspect mismatches with a time span adverbial on its dominant single ongoing interpretation. This observation will play a role in the Predictions section (see Section 5.2.3.).

Unlike imperfective in (8), perfective can only be interpreted in one specific way and it can only denote a bounded episodic eventuality. Therefore, its meaning cannot be repaired (adjusted) to the meaning of the mismatching durative 'for X-time' adverbial. With these facts in mind, we might expect different brain reactions to contexts involving perfective and imperfective verbs and their mismatching adverbial modifiers, that is, a durative adverbial and a time span adverbial respectively.

3. Relevant Background on the Incrementality (Timing) of Aspectual Interpretation

There is a lot of controversy as to the domain of interpretation of aspect. In highly incremental approaches (Marslen-Wilson and Tyler 1980), it is assumed that the parser uses verbal information immediately and starts the interpretation right away when processing individual words. Frazier (1999) postulates a slightly weaker variant and argues that the parser must choose between grammatically incompatible meanings of a word or constituent immediately, by the end of the word or constituent, unless this conflicts with the dictates of the grammar. More recently, Pickering and Frisson (2001), Pickering et al. (2006), and Frisson (2009) claim that in the case of a semantically underspecified verb the processor does not commit to any of its possible senses but rather it initially activates an underspecified representation and subsequently homes in on the precise sense.

Regarding the processing of aspectual meanings, Husband and Stockall (2015) propose a two-stage model of aspectual processing. In the first stage, verbal and nominal properties license the construction of the VP and in the second stage AspP is projected and the parser is ready to commit to an aspectual interpretation based on the syntactic structure arrived at through the first stage. They based this conclusion on the results of their self-paced reading study in which they investigated the role of the verb and the direct object in aspectual interpretation in sentences with achievements such as *lose*, *find*, *reach* (clearly terminative) and accomplishments (unspecified for telicity) *read*, *build*, *repair* followed by plural NP objects with a definite determiner or by bare plural NP objects; see (10).

(10)   a.   The expert physicist lost the files on the formation of black holes.

       b.   The expert physicist lost files on the formation of black holes.

       c.   The expert physicist read the files on the formation of black holes.

       d.   The expert physicist read files on the formation of black holes.

Husband and Stockall (2015) report a main effect of the definite article on the noun position and an interaction between verb class and the definite article at

one position after the noun. More specifically, they obtained significant differences between accomplishment verbs with bare objects and accomplishment verbs with definite objects and significant differences between achievements with bare plural objects and accomplishments with bare plural objects. This could be evidence that telicity is only computed for full VPs and the VP that is atelic (accomplishments with bare plural objects) obtained significantly longer reading times on the object position and one position following the object. Additionally, they did not obtain any significant main effects of verb class between achievement and accomplishment infinitive verbs used in their lexical decision experiment. However, they report a significant interaction of lexical verb type and anteriority in their MEG study, where they report more positive activity in the anterior hemisphere and more negative activity in the posterior hemisphere for telic verbs. Their analyses were time-locked to the onset of the verb. Even though they provide evidence only from English, they argue that it should be cross-linguistically valid that aspectual interpretation is computed upon completion of the VP, since only then can AspP be generated and this is the place for the composition of aspectual meanings.

Stockall, Husband, and Beretta (2010) emphasize that they use the term **aspect** to refer to lexical aspect. Therefore it remains unresolved whether the same generalization can be extended to languages with grammatical aspect (for more discussion, see Husband and Stockall 2015). In this respect, Bott and Hamm (2014) postulate a cross-linguistic aspectual variation hypothesis according to which the processor immediately commits to an aspectual interpretation if a language has the grammatical means to express an aspectual distinction, as in Russian. In contrast, the parser does not immediately commit to an aspectual interpretation in a language that lacks grammatical means to express an aspectual distinction, as is the case in German. Evidence for this hypothesis was provided by Bott and Gattnar (2015). In their eye-tracking experiments, they compared the processing of Russian and German sentences with transitive achievement verbs (e.g., *win*, *spot*, *reach*) and mismatching durative 'for X-time' adverbials. Russian and German differ in how aspectual meanings are computed. Russian verbs are specified for either perfective or imperfective aspect. While perfective verbs view an event from the outside, the imperfective aspect views an event from the inside (Comrie 1976). By contrast, this opposition is not encoded in German verbs. However, both German and Russian achievement verbs denote punctual events, which are incompatible with durative adverbials. Based on Krifka 1992, Bott and Gattnar (2015) expected that in aspect languages perfective aspect determines the aspectual interpretation of verb phrases without relying on the semantic contribution of nominal arguments, whereas in non-aspect languages the nominal arguments are crucial for the aspectual interpretation of the VPs. They predicted that in Russian mismatches should be detected solely on the basis of the perfective verb and the adverbial, whereas in German the expectation was that the de-

tection of mismatches should rely on the entire verb-argument structure. Russian readers immediately noticed the mismatch independently of whether the verb preceded or followed its arguments, whereas German readers showed mismatch effects only after a complete predication. This generalization is compatible with Filip and Rothstein's (2006) telicity parameter, according to which telic meaning is composed at the level of V in Russian and at the level of VP in English, and with Rothstein's (2015) broader generalization according to which there is a parametric difference between Russian (and potentially other Slavic languages) and English (and potentially other Germanic languages) aspectual systems in that in English aspectual operators operate at the VP level while in Russian they operate on the V.

We decided to extend this line of research (in particular the research of Bott and Gattnar 2015) by testing the processing of perfective and imperfective verbs of accomplishment predicates in Polish. Concerning the mismatch with perfective verbs, based on the study by Bott and Gattnar (2015), we should expect an effect of the mismatch directly on the verb and not on its complement. An alternative prediction would be based on a more syntax-based approach proposed by Husband and Stockall (2015), according to which it should be cross-linguistically the case that the aspectual interpretation cannot happen before the VP is completed, which would mean that the effect of the aspectual mismatch should be reflected rather on the object (under the canonical word order).

Concerning imperfective aspect, as we pointed out in Section 2.2.2., imperfective aspect is a multiply ambiguous category with its single ongoing reading being dominant. In the theoretical literature, there are two major approaches to the composition of the meaning of imperfective aspect: compositional approaches and underspecification approaches. Regarding the former, imperfective aspect is treated either as a universal quantifier over events or situations (Bonomi 1995; Cipria and Craige 2000; Lenci and Bertinetto 2000; Arregui, Rivero, and Salanova 2014) or as an existential quantifier over singular or plural events in the denotation of verbal predicates (Ferreira 2005). Under the underspecification approach, imperfective aspect is regarded as a non-aspect (Paslawska and von Stechow 2003; Willim 2006) or it is assumed its meaning is semantically vacuous (underspecified) (Hacquard 2006). The underspecification view is compatible with the findings of a recent psycholinguistic study by Klimek-Jankowska et al. (2018) in which they compare the time-course of processing of analogous sentences with perfective and imperfective verbs and it is shown that reading measures are longer on sentence final regions in the latter case. This suggests that in the absence of any disambiguating contextual cues the parser delays the process of interpreting imperfective aspect in Polish. In a recent study by Lukassek et al. (2017), they report the results of their reading-time experiment and indicate that the specification of an underspecified structure—motion verbs in German—proceeds

effortlessly. Coming back to the question of the domain of interpretation of imperfective aspect, if its meaning is truly underspecified, we would not expect any immediate effect of a mismatch on the verb or object in mismatching conditions with sentence-initial adverbials. However, in mismatching conditions with a postverbal temporal adverbial (under the assumption that imperfective aspect is interpreted incrementally at AspP), a visible brain reaction to a mismatch is expected. This is so because at the level of AspP the aspectual value is computed and the parser has to commit to some interpretation, which in the absence of further contextual cues is the most frequent one. Since in all the experimental sentences singular NP objects were used, we expect the parser to favor the single ongoing interpretation (see Section 2.2.2.).[8]

In order to be able to formulate predictions as to expected ERP signatures, in the following section we briefly present the relevant linguistic ERP components and summarize findings of relevant ERP studies on aspectual mismatches.

4. ERP Studies on Aspectual Mismatches

4.1. A Brief Introduction to the ERP Method

As stated in Kaan (2007), event-related brain potentials (ERPs) have turned out to be extremely valuable for the cognitive neuroscience of language. This method is used in research on how language is processed in real time. Electrical brain activity is recorded by placing electrodes on the subject's scalp. ERPs are the brain waves that reflect the brain's reaction to a stimulus, which constitutes the event of interest. Several waveforms (also referred to as components) are distinguished as reflecting different aspects of word and sentence comprehension and production. A component can be defined on the basis of its polarity, latency, duration, and its distribution across the scalp. The name of the component usually corresponds to these characteristics. For instance, one of the most relevant components in linguistic research are the LAN, N400, and P600. The LAN (left anterior negativity) is a negative-going waveform peaking between 300–500 ms from the onset of the critical stimulus, and it is most prominent at left anterior scalp positions. This component is observed for grammatical violations, and it usually has been associated with difficulty with morpho-syntactic agreement processes (Friederici 2002). Some scholars take it to be a more general index of working memory load (Kluender and Kutas 1993a, b; Coulson, King, and Kutas 1998; Rösler et al. 1998). The second component, the N400, is also a negative going brain wave peaking between

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[8] That the grammatical number of objects significantly affects the interpretation of imperfective verbs has been experimentally demonstrated by Klimek-Jankowska and Błaszczak (to appear)

300 and 500 ms after onset of the critical stimulus but with a right-central and posterior scalp distribution. According to Kaan (2007), the prevailing view of the N400 is that it reflects difficulty with semantically integrating the stimulus into the stimulus context. Its amplitude may be sensitive to the expectancy of a word in a given context, its frequency and semantic plausibility. The third most often elicited component in linguistic studies is the P600 component. It is a positive deflection with a posterior maximum peaking between, roughly, 500 and 900 ms. The P600 is standardly interpreted as reflecting a difficulty in syntactic integration (including monitoring and non-automatic revision processes) (Osterhout and Holcomb 1992; Hagoort, Brown, and Groothusen 1993; Friederici 2002).

4.2. Overview of Relevant Findings

In recent years there have been quite a few ERP studies investigating aspectual mismatches. However, those studies have been conducted mostly on English and German. We need to take into account the fact that the processing of aspect in Polish relies on the interaction between lexical aspect and grammatical aspect and therefore is different from aspectual interpretation based on lexical aspect, as is the case in Germanic languages (the exception being the progressive aspect in English; see Bott 2016).

In his study on aspectual coercion in German, Bott (2010; see also Bott 2016) reports a sustained anterior negativity (working memory LAN) in the time window 500–900 ms in response to additive coercion observed in sentences with an 'in X-time' prepositional phrase incompatible with a punctual achievement verb, as exemplified in *In zwei Stunden hatte der Förster die Falle entdeckt* ('Within two hours, the ranger had discovered the trap'), as compared to control sentences of the type *Vor zwei Stunden hatte der Förster die Falle entdeckt* ('Two hours ago the ranger had discovered the trap'). In addition, Bott (2010) reports a P600 in response to an unresolvable aspectual mismatch in sentences with a 'for X-time' adverbial phrase and a punctual achievement verb, as in *Ganze zwei Stunden hatte der Förster die Falle entdeckt* ('For two hours, the ranger had discovered the trap'), as compared to control sentences. Bott (2010) interprets the obtained P600 signature as an index of a semantic interpretation difficulty at the phrasal level. Regarding the sustained negativity (a working memory LAN), Bott (2010) takes it to reflect the enrichment of the achievement eventuality with an appropriate preparatory process, which has to be inferred on the basis of world knowledge leading to the enhancement of working memory load (pp. 226–27).

A similar finding has been recently reported by Paczynski, Jackendoff, and Kuperberg (2014). In their ERP study of neurocognitive mechanisms underlying aspectual coercion, they investigated the processing of punctive and durative verbs in contexts with three types of prepositional phrases: (i) punc-

tive, (ii) durative, and (iii) frequentative. They report a late, sustained negativity between 500–1200 ms for the comparison between punctive verbs in durative contexts (e.g., *For several minutes the cat pounced on the rubber mouse*) and punctive verbs in punctive contexts (e.g., *After several minutes the cat pounced on the rubber mouse*). Additionally, they obtained a late sustained negativity between 800–1200 ms for punctive verbs in durative contexts relative to punctive verbs in frequentative contexts (e.g., *Several times the cat pounced on the rubber mouse*). Both contexts (the one with a durative and the one with a frequentative adverbial) were found to require a reinterpretation of the punctive eventuality *pounce* into an iterative one. There is, however, an important difference in the mechanisms by which the required iterative interpretation is achieved. With a frequentative adverbial and a punctive verb, the iterative interpretation can be achieved through simple compositionality by combining the meaning of the frequentative phrase, *several times* (explicitly specifying the iterative character of the eventuality) and the meaning of the verb *pounce* without any need for an additional semantic (implicit) operator. By contrast, with a punctive verb *pounce* and a durative adverbial *for several minutes*, the iterative meaning cannot be achieved by simple composition. There is a need for an additional morphosyntactically unrealized mechanism of enriched composition, which is referred to as aspectual coercion. The authors suggest that it is the engagement of this morphosyntactically unrealized semantic operator in the interpretation of the linguistically described event that is reflected in the observed late sustained negativity. More specifically, this negativity reflects the increased working memory demands related to the elaborative semantic processing required to arrive at the correct interpretation of an event, which cannot be achieved through the simple composition of the meanings of the overtly realized elements of the sentence. Interestingly, the authors also observed a negativity in an earlier time window 300–400 ms, but it did not reach significance.

In a recent study, Yano (2018) takes this latter observation as motivation for his ERP experiment on additive and substractive aspectual coercion in Japanese. The hypothesis tested in his study was that the LAN observed in the previous studies actually consists of two subcomponents reflecting distinct cognitive functions: the earlier LAN is enhanced due to a prediction error pertaining to aspectual information, whereas the later LAN reflects some phases of the reinterpretation (p. 721). The reason why the earlier LAN was not detected in Bott's (2010) study on aspectual coercion in German and it did not reach statistical significance in Paczynski, Jackendoff, and Kuperberg 2014 is that the predictive mechanisms underlying it are only detectable when there is enough time for the prediction to arise, as Yano (2018) proved by manipulated the Stimulus Onset Asynchrony (SOA) and keeping the same experimental material. More precisely, in the long SOA condition, each phrase was presented for 700 ms with an inter-stimulus interval (ISI) of 100 ms, whereas

in the short SOA condition, each phrase was presented for 400 ms with a 100 ms ISI (p. 723). The early LAN was elicited only with the long SOA, whereas the late LAN was found in both conditions. Yano (2018: 729) suggests that the early anterior negativity may not reflect an aspectual reinterpretation process but rather a penalty arising from an incorrect prediction for the aspectual interpretation for the verb based on the preceding temporal adverb. The reinterpretation process is then reflected in the late LAN.

In the studies by Bott (2010), Paczynski, Jackendoff, and Kuperberg (2014), and Yano (2018), the focus was on the processing of incongruous combinations of aspectual meanings of verbs and adverbial phrases in languages in which aspectual interpretation relies predominantly on lexical aspect. Little is known about the neurocognitive mechanisms involved in the processing of incongruous combinations of aspectual verb meanings with mismatching adverbials or other conflicting aspectual markers in languages with a rich system of grammatical aspect (i.e., in languages where different aspectual meanings are morphologically realized). An exception to this is the study by Zhang and Zhang (2008), who studied violations in agreement between different markers of grammatical aspect in Chinese. Chinese has several aspectual markers; some of them can cooccur (*yijing* and *le*, both being perfective markers) and some of them create a mismatch (e.g., perfective *le* with a progressive *zhengzai*). In their study, Zhang and Zhang compared sentences with agreeing aspectual markers, for example, *Su Jun yijing* (PERF, 'already') *prepare le* (PERF) *fruit and cookies* ('Su Jun prepared fruit and cookies already') with sentences containing mismatching aspectual markers, as in *Su Jun zhengzai* (PROG 'ongoing') *prepare le* (PERF) *fruit and cookies*. They report a biphasic 200–400 ms left central and posterior negativity and P600 pattern for this comparison. The authors interpret the P600 as "reflect[ing] syntactic repair or the monitoring and resolution of conflict caused by the aspect disagreement" (p. 1042). Concerning the reported left central and posterior negativity, they argue that it is not a typical LAN (because of the lack of anterior distribution) nor a typical N400 (because of different spatial and temporal properties) (see also Dillon et al. 2015). Instead, they interpret the obtained negativity "as reflect[ing] either a failure to bind aspect markers or the detection of aspectual errors".

Interestingly, early negativity was also found by Flecken, Walbert, and Dijkstra (2015), who investigated the reaction of the brain in response to aspect agreement violations between temporal context and verb morphology in English contexts of the type **Right now, John swims in the pool* and **Every Tuesday, John is swimming in the pool*, as compared to *Right now, John is swimming in the pool* and *Every Tuesday, John swims in the pool*. All the experimental items were preceded by a question that triggered an expectation for a specific form of the verb in the experimental sentence, for example, *What is John doing in the pool right now?* and *What does John do in the pool every Tuesday?* The authors were interested in whether the ERP responses to aspectual agreement violations

would be similar to standard morphosyntactic (e.g., *Right now, the woman are swimming in the pool*) and semantic violations (e.g., *Today, the boy is cooking in the pool*) for which they report typical brain responses: P600 (in the time window 500–800ms) and N400 (in the time window 350–500 ms) respectively. By contrast, the aspectual agreement violation triggered an early negativity that was short-lived (time window 250–350 ms) and had a central scalp distribution with an anterior onset. The early negativity did not continue into the N400 or P600. They interpret the aspect-related Early Negativity as reflecting a violation of expectations regarding the form of the verb phrase (*is reading* vs. *reads*) triggered by the preceding temporal information (*right now*, *every Tuesday*) and the form of the preceding question. Since the early negativity bears some resemblance to the findings of earlier studies examining the violation of phonological or semantic expectations, the authors emphasize that early negativity might be part of a more general neural mechanism triggered by a violation of form-level expectations (see Flecken, Walbert, and Dijkstra 2015 for further discussion and references).

5. The Present Study

To assess the acceptability of the constructions being tested (see examples (1) and (2)), we performed an online acceptability rating study.

5.1. An Online Acceptability Rating Questionnaire

5.1.1. Description

Altogether, the material consisted of 136 sentences: 12 sentences per condition (12 x 8 conditions) plus 40 fillers (half grammatical, half ungrammatical). The sentences (both the experimental sentences and the fillers) used in the study were selected from the material prepared for the ERP experiment (see Section 5.2.2.).

The following combinations were tested: perfective verbs with matching 'in X-time' and mismatching 'for X-time' adverbials in preverbal and postverbal positions and imperfective verbs with matching 'for X-time' and mismatching 'in X-time' adverbials in preverbal and postverbal positions. The constructed sentences were distributed across four lists using Latin square design. Each list contained 24 experimental sentences plus 40 fillers (20 grammatical and 20 ungrammatical). The same 40 fillers were used in each list. All of the test items and fillers in each list were randomized. Different lists were created in order to alleviate the participants' fatigue and show lexical variation in each list. We obtained responses from 98 participants (18 for list 1, 24 for list 2, 26 for list 3, and 30 for list 4). All of the participants were na-

tive speakers of Polish and students from the University of Wrocław, Adam Mickiewicz University in Poznań, the University of Silesia in Katowice, or the John Paul II Catholic University of Lublin. None of them participated in the reported ERP study. The participants rated the acceptability of the tested sentences on a scale from 1 to 5, where 1 is totally unacceptable and 5 is totally acceptable.

5.1.2. Results

The results of the acceptability rating study are presented in Table 1 on the following page. Statistical analysis was conducted in the R program (version 3.6.3) on a Windows-compatible PC (R Development Core Team 2020). The differences in acceptability ratings between conditions in planned comparisons were determined by fitting the ordinal regression models using the polr function (MASS package Venables and Ripley 2002). The ordinal regression results for the relevant comparisons are summarized in Tables 2 and 3 on pages 42–43.

The results of the questionnaire study confirm that there is a clear difference between matching and mismatching conditions for perfective and imperfective conditions. Mismatching combinations were rated as significantly less acceptable than matching combinations both for perfective and imperfective aspect. This suggests that participants noticed the mismatch. There was also a significant difference in acceptability between grammatical and ungrammatical fillers, which suggests that participants read sentences attentively. Additionally, there was a significant difference between analogous mismatches with preverbal and postverbal adverbials. Mismatches (both perfective and imperfective) with postverbal adverbials were rated significantly less acceptable than the corresponding mismatches with preverbal adverbials. The obtained acceptability results suggest that we should expect a brain reaction to mismatches as compared to the corresponding matches and that the brain reaction might be different in the case of postverbal mismatches than in the case of preverbal mismatches.

5.2. ERP Experiment

To assess our research questions formulated in Section 1, two ERP experiments based on the same lexical material were conducted. In both experiments perfective and imperfective verbs were used in combination with a matching or mismatching temporal adverbial. Crucially, in Experiment 1 the temporal adverbial preceded the perfective/imperfective predicate, while in Experiment 2 the temporal adverbial was placed after it. The manipulation of the word order (the position of the temporal adverbial with respect to the ver-

Table 1. Proportions of acceptability rating

Condition	acc1	acc2	acc3	acc4	acc5
PFV_MISMATCH_PREVERBAL	0.24914676	0.24232082	0.23208191	0.19112628	0.08532423
PFV_MATCH_PREVERBAL	0.06506849	0.12671233	0.17123288	0.29794521	0.33904110
IPFV_MISMATCH_PREVERBAL	0.25255973	0.30716724	0.23549488	0.13993174	0.06484642
IPFV_MATCH_PREVERBAL	0.01706485	0.03754266	0.12969283	0.29692833	0.51877133
PFV_MISMATCH_POSTVERBAL	0.22685185	0.32870370	0.18055556	0.18287037	0.08101852
PFV_MATCH_POSTVERBAL	0.10084034	0.19327731	0.13865546	0.20168067	0.36554622
IPFV_MISMATCH_POSTVERBAL	0.39655172	0.39310345	0.21034483	0.00000000	0.00000000
IPFV_MATCH_POSTVERBAL	0.00000000	0.00000000	0.13605442	0.38775510	0.47619048
FILLER_CORR	0.01166181	0.02623907	0.04664723	0.12244898	0.79300292
FILLER_INCORR	1.00000000	0.00000000	0.00000000	0.00000000	0.00000000

Table 2. Relevant comparisons between matching and mismatching conditions—results of ordinal regression

Comparison	Value	Std. Error	T value	P value	comment
PFV_MATCH_PREVERBAL vs. PFV_MISMATCH_PREVERBAL	−1.6367548	1.538677e-01	−1.063742e+01	1.995824e-26	match pfv rated sig better
IPFV_MATCH_PREVERBAL vs. IPFV_MISMATCH_PREVERBAL	−2.72054562	1.583077e-01	−1.718518e+01	3.428786e-66	match ipfv preverb rated sig better
PFV_MATCH_POSTVERBAL vs. PFV_MISMATCH_POSTVERBAL	−1.5176152	1.551736e-01	−9.780112e+00	1.370584e-22	match pfv postverb rated sig better
IPFV_MATCH_PREVERBAL vs. IPFV_MISMATCH_POSTVERBAL	−3.58284425	1.584527e-01	−2.261144e+01	3.344733e-113	match ipfv postverb rated sig better

Table 3. Relevant comparisons between conditions with preverbal and postverbal adverbials—results of ordinal regression

Comparison	Value	Std. Error	T value	P value	comment
PFV_MATCH_PREVERBAL vs. PFV_MATCH_POSTVERBAL	−0.2137697	1.649421e-01	−1.296028e+00	1.949658e-01	NO SIG DIFF
IPFV_MATCH_PREVERBAL vs. IPFV_MATCH_POSTVERBAL	−0.01474372	1.517850e-01	−9.713554e-02	9.226188e-01	NO SIG DIFF
PFV_MISMATCH_PREVERBAL vs. PFV_MISMATCH_POSTVERBAL	−2.58513130	1.467523e-01	−1.761561e+01	1.869655e-69	mismatch pfv preverb rated sig better
IPFV_MISMATCH_PREVERBAL vs. IPFV_MISMATCH_POSTVERBAL	−1.10678785	1.496245e-01	−7.397101e+00	1.391898e-13	mismatch ipfv preverb rated sig better

bal predicate) is particularly relevant for determining the domain of aspectual interpretation of perfective and imperfective aspect.

5.2.1. Participants

Twenty eight native speakers of Polish (18 females, mean age 20.5, range 19–40) were recruited for Experiment 1 and a different group of twenty eight native speakers of Polish (22 females, mean age 20.5, range 22–24) were recruited for Experiment 2 all from the University of Wrocław at the Institute of English Studies.[9] Participants received partial course credit. All participants were right-handed according to the Edinburgh Handedness Inventory (Oldfield 1971) and had normal or corrected vision. None reported neurological or psychiatric disorders or traumas.

5.2.2. Material and Experimental Design

In each experiment there were four experimental parts. Each part contained the same verbal predicate, which differed in its aspectual form: it was perfective in two cases and imperfective in the other two. Only accomplishment verbs were included (see the Appendix), and all the verbs had the same form (third person singular masculine past) followed by a singular inanimate object. In the two perfective and imperfective sentences there was one with a matching temporal adverbial and another with a mismatching temporal adverbial, as shown in (11).

(11) **Experimental combinations**

Condition 1: PERFECTIVE_MISMATCH
Perfective verb + mismatching durative ('for X-time') temporal adverbial

Condition 2: PERFECTIVE_MATCH
Perfective verb + matching time span ('in X-time') temporal adverbial

Condition 3: IMPERFECTIVE_MISMATCH
Imperfective verb + mismatching time span ('in X-time') temporal adverbial

Condition 4: IMPERFECTIVE_MATCH
Imperfective verb + matching durative ('for X-time') temporal adverbial

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[9] There are no ethical issues raised by the reported research. The study is in compliance with the EU legislation on ethics Charter of Fundamental Rights of the EU (2000/C 364/01) and ECHR and the Declaration of Helsinki (2013).

Experiments 1 and 2 were identical except for the positioning of the temporal adverbials. In Experiment 1 the temporal adverbial preceded the verbal predicate while in Experiment 2 it followed the verbal predicate. An example of a stimulus quartet used in Experiment 1 and Experiment 2 is provided in (12) and (13) respectively.

(12)   **Experiment 1**

   Condition 1: PERFECTIVE_MISMATCH

   *Przez minutę cichutko **otworzył**   zamek,
    for minute   quietly   open$_{PFV.PST.3SG.M}$ lock$_{ACC}$

   żeby   nie obudzić   żony.
   in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

   [Intended] 'He silently opened the lock for a minute in order not to wake up his wife.'

   Condition 2: PERFECTIVE_MATCH

   W minutę cichutko **otworzył**   zamek,
   in minute   quietly   open$_{PFV.PST.3SG.M}$ lock$_{ACC}$

   żeby   nie obudzić   żony.
   in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

   'He silently opened the lock in a minute in order not to wake up his wife.'

   Condition 3: IMPERFECTIVE_MISMATCH

   W minutę cichutko **otwierał**   zamek,
   in minute   quietly   open$_{IPFV.PST.3SG.M}$ lock$_{ACC}$

   żeby   nie obudzić   żony.
   in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

   [Impossible] 'He was silently opening the lock in a minute in order not to wake up his wife.'

   Condition 4: IMPERFECTIVE_MATCH

   Przez minutę cichutko **otwierał**   zamek,
   in   minute quietly   open$_{IPFV.PST.3SG.M}$ lock$_{ACC}$

   żeby   nie obudzić   żony.
   in order to … NEG wake.up$_{PFV.INF}$ wife$_{GEN}$

   'He was silently opening the lock for a minute in order not to wake up his wife.'

(13)　**Experiment 2**

Condition 1: PERFECTIVE_MISMATCH

*Cichutko **otworzył**　　　　zamek **przez minutę**,
 quietly　　open$_{PFV.PST.3SG.M}$　lock$_{ACC}$　for　　　minute

żeby　　　　　nie　obudzić　　　żony.
in order to …　NEG　wake.up$_{PFV.INF}$　wife$_{GEN}$

[Intended] 'He silently opened the lock for a minute in order not to wake up his wife.'

Condition 2: PERFECTIVE_MATCH

Cichutko **otworzył**　　　　zamek **w minutę**,
quietly　　open$_{PFV.PST.3SG.M}$　lock$_{ACC}$　in　minute

żeby　　　　　nie　obudzić　　　żony.
in order to …　NEG　wake.up$_{PFV.INF}$　wife$_{GEN}$

'He silently opened the lock in a minute in order not to wake up his wife.'

Condition 3: IMPERFECTIVE_MISMATCH

Cichutko **otwierał**　　　　zamek **w minutę**,
quietly　　open$_{IPFV.PST.3SG.M}$　lock$_{ACC}$　in　minute

żeby　　　　　nie　obudzić　　　żony.
in order to …　NEG　wake.up$_{PFV.INF}$　wife$_{GEN}$

[Impossible] 'He was silently opening the lock in a minute in order not to wake up his wife.'

Condition 4: IMPERFECTIVE_MATCH

Cichutko **otwierał**　　　　zamek **przez minutę**,
quietly　　open$_{IPFV.PST.3SG.M}$　lock$_{ACC}$　for　　　minute

żeby　　　　　nie　obudzić　　　żony.
in order to …　NEG　wake.up$_{PFV.INF}$　wife$_{GEN}$

'He was silently opening the lock for a minute in order not to wake up his wife.'

In each experiment 320 stimulus sentences were constructed. Out of these 320 stimuli, 160 sentences served as experimental items and 160 as fillers. There were 40 sentences per combination in each experiment (40 x 4 = 160). All experimental items had an identical structure consisting of a main clause and an embedded clause. The main clause consisted of a temporal modifier, a modal modifier, a verbal predicate, which was always in the third person singular masculine past form, and an inanimate singular object.

Since the same verbs were used in the compared sentences, we did not check their frequency as it was identical across the relevant conditions. We took extra steps to balance the length of our perfective and imperfective sentences. Because of the peculiarities of Polish aspectual morphology, bare imperfectives like *pisać* 'to write$_{IPFV}$' are normally shorter than their perfective counterparts, for example, *podpisać* 'to sign$_{PFV}$' (see Section 2.2.1. and 2.2.2.). To counterbalance this discrepancy in word length across perfective and imperfective conditions, we used 50% of bare imperfective forms, and the other 50% had a secondary (derived) form with additional imperfectivizing morphology, for example, *podpisywać* 'sign'). Notice that secondary imperfective forms are not only longer than bare imperfective verbs but also longer than the perfective forms from which they are derived. This resulted in creating pairs of perfective and imperfective verbs out of which 50% had a longer perfective form and 50% had a longer imperfective form.

Fillers were structurally similar to experimental items in that they also consisted of a main and an embedded clause, as illustrated in (14). Half of the fillers were ungrammatical. We used ungrammatical fillers to distract the participants from the main purpose of the experiment, and for this reason we used two types of grammatical violations in the embedded sentences (recall that the mismatches investigated in our experiments were present in the matrix sentences). The types of ungrammaticality consisted in either the use of a wrong aspectual form of the verb (see (14a)) or a wrong inflectional form of the verb (see (14b)). The ungrammatical forms are written in bold in the examples. The correct form in (14a) would be *dotknę* 'touch$_{PFV.PRS.1SG}$' and the correct form in (14b) would be *był zadowolony* 'was satisfied'.

(14) a. *Dam   ci   znać, zanim **dotykam**
          give$_{PFV.PRS.1SG}$ you know   before touch$_{IPFV.PRS.1SG}$

          czarnej skrzynki.
          black   box

          [Intended] 'I will let you know before I am touching the black box.'

      b. *Ola spyta   Janka o   zdanie, żeby
          Ola   ask$_{PFV.PRS.3SG}$ Janek about opinion in order to

          będzie zadowolony.
          will.be   satisfied

          [Intended] 'Ola will ask Janek for his opinion so that he will be satisfied.'

Fillers were structurally similar to experimental items in that they also consisted of a main and an embedded clause. Half of the fillers were ungrammatical.

5.2.3. Planned Comparisons and Predictions

The following comparisons were planned for each experiment:

(15) **Experiment 1**: Temporal Adverbial – Verb – Object

    Comparison 1:
    Condition 1: PERFECTIVE_MISMATCH
    Condition 2: PERFECTIVE_MATCH

    Comparison 2:
    Condition 3: IMPERFECTIVE_MISMATCH
    Condition 4: IMPERFECTIVE_MATCH

(16) **Experiment 2**: Verb – Object – Temporal Adverbial

    Comparison 3:
    Condition 1: PERFECTIVE_MISMATCH
    Condition 2: PERFECTIVE_MATCH

    Comparison 4:
    Condition 3: IMPERFECTIVE_MISMATCH
    Condition 4: IMPERFECTIVE_MATCH

In what follows we present our predictions related to each of the comparisons based on the earlier discussion in Section 3 and 4.

Predictions Related to Comparison 1

A sentence-initial adverbial sets up a frame within which the eventuality should be interpreted. The eventuality to be integrated with a sentence-initial durative adverbial should also feature durative semantics. As discussed in Section 2.2.1., perfective aspect has a very specific (bounded) semantics that makes it semantically incompatible with a durative adverbial. This should lead to a problem with semantic integration of a perfective verb with the preceding durative adverbial. Hence, we expect an N400 signature in this case, which reflects semantic integration difficulties (see Kaan 2007 and references therein). The expected N400 might be followed by a P600 (usually taken to reflect syntactic repair or reprocessing; see, among others, Osterhout and Holcomb 1992; Hagoort, Brown, and Groothusen 1993; Gouvea et al. 2010), since this mismatch cannot be repaired, as discussed in Section 2.3.

If the domain of interpretation of perfective aspect in Polish is the verb, the predicted effects should be manifested directly on the verb. Alternatively, if the domain of interpretation of perfective aspect in Polish is not just the verb but the VP (as the input to AspP), the predicted effects should be manifested on the object.

Predictions Related to Comparison 2

In Comparison 2, the time span adverbial was also used sentence-initially and it was followed by an imperfective verb, which has an unbounded semantics. This may lead to a semantic-integration problem (as expected on the basis of our acceptability-rating study). However, as shown in Section 2.3., due to the underspecified semantics of imperfective aspect, the mismatch between a time-span adverbial and imperfective aspect is resolvable, unlike in the case of the mismatch in Comparison 1. Therefore, we can expect an N400 component but with a weaker amplitude than in Comparison 1.

If the resolution of the underspecification of imperfective aspect involves a kind of repair mechanism relying on working memory, comparable to that discussed in the literature for German and English, a late sustained negativity (a working memory LAN) is expected or a combination of an early and a late anterior negativity, as argued for by Yano (2018).

Alternatively, if the resolution of the underspecification of imperfective aspect involves a simple adaptation of the meaning of the verb to that imposed by a preceding temporal adverbial, possibly no increase in computational costs is involved. In this case the mismatching condition should not trigger any ERP effects (see Lukassek et al. 2017).

If the domain of interpretation of imperfective aspect is the same as the domain of perfective aspect in Polish, the possible N400 effect should be manifested in exactly the same position (namely either the object or the verb) in a mismatching context as in Comparison 1.

Predictions Related to Comparison 3

The mismatching durative adverbial is processed after the aspectual value on AspP is set (computed). In this case, we may expect an integration problem in terms of a dissonance between the aspectual value of a perfective verb computed at AspP and the value of the incoming adverbial. Given that the nature of this integration problem is more syntactic, the expected component may be a LAN (Gouvea et al. 2010; Yano 2018) or an early P600 (Molinaro, Barber, and Carreiras 2011). According to Molinaro, Barber, and Carreiras (2011: 908), while the LAN reflects violation of expectancy elicited by the trigger (in our case perfective aspect), an early P600 reflects problems with the structural

integration of the trigger (perfective aspect) and target (the mismatching adverbial) at the sentence level. This prediction is compatible with the results of our acceptability-rating questionnaire. Recall that postverbal mismatching conditions received significantly lower acceptability ratings than preverbal mismatching conditions.

Predictions Related to Comparison 4

A similar prediction as in Comparison 3 can be made in Comparison 4. Even though imperfective verbs have underspecified semantics, the parser commits to their preferred interpretation (aspectual value) at the level of AspP. Consequently, the following adverbial mismatching the preferred aspectual value may lead to a LAN component, which is taken to reflect morphosyntactic violations caused by a mismatch with predicted features (Molinaro, Barber, and Carreiras 2011; cf. also Yano 2018).

5.2.4. Procedure

Participants were tested individually in a single session. The whole experiment (including the application of electrodes) lasted for approximately 90 minutes. Following the application of the EEG electrodes, participants were seated one meter in front of a Samsung 22" LCD screen in an electrically and acoustically shielded EEG chamber. Stimuli were presented in a white courier font, size 48, on a black background using the Presentation software by Neurobehavioral Systems Inc. (software package 16.3 12.20.12).

The experimental session was preceded by oral and written instructions and a practice session. Participants were instructed to avoid blinks or movements during sentence display and answer the questions as fast as possible. After the written instruction, participants received a practice block with 10 sentences, followed by explicit feedback. The practice session was followed by five experimental blocks containing 64 sentences each. After each block there was a break.

Each trial began with a fixation asterisk in the center of the screen for 1500 ms, followed by sentence presentation. Sentences were presented word-by-word, only the prepositional phrases were presented as chunks:

Przez minutę | cichutko | otworzył | zamek | żeby … .

Each segment appeared in the center of the screen for 500 ms, followed by a short 100 ms blank screen. Sentence-final words appeared with a period, and were followed by a 100 ms blank screen. Probes were presented for 500 ms. After that, the words TAK ('yes') and NIE ('no') were presented on the screen

for 3000 ms, as a prompt for the probe detection task. After 3000 ms, the presentation of the next trial began with the presentation of the new asterisk.

The language material was outlined in Section 5.2.2. We used 40 stimulus quartets supplemented by 160 fillers. 10% of all the sentences including experimental and filler sentences were followed by a probe detection task in which the participants' were to decide whether the displayed word (a probe) was used in the sentence just read. In the remaining 90% of the trials, the participants did nothing but reading silently. The probe words were equally distributed across conditions. There was an equal number of probes semantically or phonologically corresponding to different elements in main and embedded clauses. The probes were balanced for the expected YES and NO answers. The mean answer accuracy in the probe detection task was 91.5% (SD = 4.8%) in Experiment 1, and 96.2 (SD = 3.4) in Experiment 2.

In each experiment stimuli were pseudo-randomized in two versions (with descending and ascending order) and distributed over five blocks containing 64 items each. All participants saw all of the 320 sentences in each experiment.[10] The first randomization variation was presented to 14 participants, and 14 saw the second. Additionally, each version was further subdivided into two variants differing in the coding for YES and NO buttons to avoid any potential effects of lateralized readiness potential.

In Experiment 1 the ERPs were elicited for the verb and its object, whereas in Experiment 2 the ERPs were elicited for the temporal adverbial and the word following it, which was always the conjunction *żeby* 'in order to').

5.2.5. EEG Recordings and Data Processing

5.2.5.1. Recording

The EEG-activity was measured with 24Ag/AgCl-electrodes that were attached to the scalp using the Easycap system at Fz, FCz, Cz, CPz, Pz, POz, FC1, F3, C3, P3, O1, FC5, CP5, F7, P7, FC2, F4, C4, P4, O2, FC6, CP6, F8, P8. The ground electrode was positioned at AFz. Electrode positions were chosen in accordance with the international 10/20 system (Jasper 1958). Signals were referenced to the A1 electrode (left mastoid) and later re-referenced to the average of left (A1) and right (A2) mastoid. Horizontal eye activity was measured by placing two electrodes 2 cm lateral to the right (EOGR) and the left (EOGL) canthus. Vertical eye activity was measured by placing two electrodes 3 cm

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[10] A more ideal way to present stimuli would be using Latin Square, which would avoid the repetition on lexical items. However, there is another important constraint in EEG, namely; a high number of item per condition is needed to get usable data. This would mean constructing a very high number of stimuli. So in EEG studies it is not uncommon that every participant sees the whole stimulus list.

above (EOGU) and below (EOGD) the pupil of the right eye. Electrode imped-ances were kept below 5 kΩ. All electrophysiological signals were digitized with a frequency of 250 Hz.

5.2.5.2. Data Processing

The data were processed using the Brain Vision Analyzer 2 software (Brain Products, Gilching). The raw data were inspected visually. Time windows, including strong, visible artefacts (like pauses or periods of strong move-ment), were manually removed before proceeding. An ICA blink correction was performed for the remaining data, using the Slope Algorithm for blink detection. After the blink correction, remaining artefacts were removed based on a semi-automatic Raw Data Inspection (maximal allowed voltage step: 50 µV/ms; maximal allowed difference: 200 µV/200 ms; lowest allowed activity: 0.5 µV/100 ms). The remaining data were segmented into time windows time-locked to the onset of the critical verb and its complement in Experiment 1 and to the critical adverbial and a word following it in Experiment 2.

Time windows began at –100 ms before the onset of the critical word, and ended at 1100 ms after the onset of the critical word. A baseline correction was performed for the 100 ms before the onset of the critical word. Averages were calculated per participant for all four conditions in Experiment 1 and 2 respectively.

The data from one participant in Experiment 1 were not taken into consid-eration due to a large number of artefacts. In Experiment 2 the data from two participants were not analysed statistically due to a large number of artefacts. The mean rejection rate over participants was 3.4% of the segments (SD = 5.2%) in Experiment 1 and 3.6% (SD = 8.9%) in Experiment 2.

In Experiment 1 mean rejection rates of segments per condition were: Condition 1 (verb/object): 1.5%/1.6% (SD = 2.3/2.3), Condition 2 (verb/object): 1.4%/1.4% (SD = 2.4/2.7), Condition 3 (verb/object): 1.3%/1.1% (SD = 2.0/1.5), Con-dition 4 (verb/object): 1.2%/0.8% (SD = 2.1/1.9). In Experiment 2 mean rejection rates of segments per condition were: Condition 1 (temporal adverbial/the word following the temporal adverbial): 1.4%/1.0% (SD = 2.6/2.5), Condition 2 (temporal adverbial/the word following the temporal adverbial): 1.4%/1.4% (SD = 1.2/1.4), Condition 3 (temporal adverbial/the word following the tem-poral adverbial): 1.4%/1.1% (SD = 3.8/3.0), Condition 4 (temporal adverbial/the word following the temporal adverbial): 2.0%/1.9% (SD = 5.3/5.1).

For visual presentation, grand averages were filtered with a 10 Hz low-pass filter.

5.2.6. Results and Discussion

5.2.6.1. Data Analysis

The time windows for the analysis were selected with reference to the literature on the processing of aspectual mismatches (Zhang and Zhang 2008; Bott 2010; Paczynski, Jackendoff, and Kuperberg 2014) and on visual inspection. We defined the following regions of interest (ROIs): left-posterior (C3, CP5, P3, P7, O1), right-posterior (C4, CP6, O2, P4, P8), right-anterior (F4, F8, FC2, FC6), left-anterior (F3, F7, FC1, FC5), and midline (Fz, FCz, Cz, CPz, Pz, POz). These regions of interest were chosen based on visual data inspection and previous studies (see Section 4.2.).

For the statistical analysis of the ERP data, we used mean amplitude values per time window per condition (Condition 1: PERFECTIVE_MISMATCH, Condition 2: PERFECTIVE_MATCH, Condition 3: IMPERFECTIVE_MISMATCH), Condition 4: IMPERFECTIVE_MATCH) in five regions of interest (ROIs). Separate analyses were conducted for each critical word: the verb and its object in Experiment 1, the temporal adverbial and the word following it in Experiment 2. Data were prepared and analyzed in R (R Development Core Team 2016), using the package ezANOVA (Lawrence 2016). Mean voltages for the single ROIs were calculated from the participants' condition mean of all electrodes in a ROI.

We calculated a repeated measures ANOVA of the mean voltages per condition for the chosen time windows in all five ROIs. Analyses were performed in a hierarchical fashion, that is, only statistically significant interactions were resolved. Interactions between CONDITION and ROI were pursued following the planned comparisons outlined above. Comparisons between conditions inside the single ROIs were performed using a repeated measures ANOVA of the mean voltages per condition. Greenhouse-Geisser corrections (Greenhouse and Geisser 1959) were applied when the degrees of freedom in the numerator were greater than 1, for which original degrees of freedom and corrected probability levels are reported. The statistical analysis was conducted for all the tested time windows and for all the planned comparisons and on the relevant positions for a given comparison. In what follows text only statistically significant effects are reported, unless stated otherwise.

5.2.6.2. Results

Experiment 1

No effects were found at the verb position in any of the comparisons. Effects were visible only at the object position and only in one comparison, namely

that between Condition 1: PERFECTIVE_MISMATCH and Condition 2: PER-FECTIVE_MATCH, as reported below. Voltage difference maps and examples of curves are given in Figure 1 on the following page.

Negativity, time window 400–500 ms from the onset of the object

Comparison 1 (Condition 1: PERFECTIVE_MISMATCH vs. Condition 2: PER-FECTIVE_MATCH): There was a statistically significant main effect of ROI ($F(4, 104) = 9.03$, $\varepsilon = .04$, $p < .001$), a statistically significant main effect of condition ($F(1, 26) = 13.42$, $\varepsilon = .03$, $p < .001$) and a statistically significant interaction of CONDITION and ROI ($F(4,104) = 3.43$, $\varepsilon = 0.01$, $p = .02$). The difference between conditions was statistically significant at left-posterior positions ($F(1, 26) = 5.94$, $\varepsilon = 0.03$, $p = .02$), right-anterior positions ($F(1, 26) = 5.74$, $\varepsilon = 0.02$, $p = .02$), left-anterior positions ($F(1, 26) = 6.96$, $\varepsilon = 0.04$, $p = .01$), and midline positions ($F(1, 26) = 23.71$, $\varepsilon = 0.07$, $p < .001$). Waveforms for PERFECTIVE_MISMATCH were more negative-going than waveforms for PERFECTIVE_MATCH at left-posterior, right-anterior, left-anterior, and midline positions. The difference between the conditions was the strongest at the midline and left-anterior positions.

Experiment 2

Effects were visible only at the temporal adverbial but not at the word following it (i.e., the conjunction *żeby*) in two comparisons, that between Condition 1: PERFECTIVE_MISMATCH and Condition 2: PERFECTIVE_MATCH and between Condition 3: IMPERFECTIVE_MISMATCH and Condition 4: IMPERFECTIVE_MATCH, as reported below. Voltage difference maps and examples of curves are given in Figure 2 on page 56 and Figure 3 on page 57.

Early positivity, time window 200–400 ms from the onset of the temporal adverbial

Comparison 3 (Condition 1: PERFECTIVE_MISMATCH vs. Condition 2: PER-FECTIVE_MATCH): There was a statistically significant main effect of ROI ($F(4, 100) = 8.94$, $\varepsilon = .08$, $p < .001$), a statistically significant main effect of condition ($F(1, 25) = 16.63$, $\varepsilon = .06$, $p < .001$), and a statistically significant interaction of CONDITION and ROI ($F(4,100) = 6.49$, $\varepsilon = 0.03$, $p < .01$). The difference between conditions was statistically significant at left-posterior positions ($F(1, 25) = 16.27$, $\varepsilon = 0.11$, $p < .001$), right-anterior positions ($F(1, 25) = 4.41$, $\varepsilon = 0.04$, $p < .05$), and left-anterior positions ($F(1, 25) = 19.97$, $\varepsilon = 0.18$, $p < .001$). Waveforms for PERFECTIVE_MISMATCH were more positive-going than waveforms for

Figure 1. Comparison 1 PERFECTIVE_MATCH and PERFECTIVE_
MISMATCH. In the upper part: Grand-average ERP pattern
for the observed N400 effect on two selected electrode sites:
Fz and FC1. In the lower part: Mean voltage difference
maps (PERFECTIVE_MISMATCH minus PERFECTIVE_
MATCH) for the time window from 400–500 ms.

PERFECTIVE_MATCH at left-posterior, right-anterior, and left-anterior po-
sitions. The difference between the conditions was the strongest at the left-
anterior and left-posterior positions.

*Negativity (LAN), time window 200–400 ms from the onset of the tem-
poral adverbial*

Comparison 4 (Condition 3: IMPERFECTIVE_MISMATCH vs. Condition 4: IM-
PERFECTIVE_MATCH): There was a statistically significant main effect of
ROI ($F(4, 100) = 6.99$, $\varepsilon = .08$, $p < .01$) and a statistically significant interaction of
CONDITION and ROI ($F(4,100) = 9.36$, $\varepsilon = 0.02$, $p < .001$). The difference between
conditions was statistically significant only at left-anterior positions ($F(1, 25)
= 11.19$, $\varepsilon = 0.09$, $p < .01$). Waveforms for IMPERFECTIVE_MISMATCH were
more negative-going than waveforms for IMPERFECTIVE_MATCH only at
left-anterior positions.

Figure 2: Comparison 3 PERFECTIVE_MATCH and PERFECTIVE_MISMATCH. In the upper part: Grand-average ERP pattern for the observed early positivity effect on two selected electrode sites: F7 and P3. In the lower part: Mean voltage difference maps (PERFECTIVE_MISMATCH minus PERFECTIVE_MATCH) for the time window from 200–400 ms.

5.2.7. Discussion

In the following, we will discuss the different findings separately and relate them to the predictions made in Section 5.2.3.

Discussion Related to Comparison 1

In Comparison 1 between Condition 1: PERFECTIVE_MISMATCH and Condition 2: PERFECTIVE_MATCH we found a negativity with a frontal, central, and posterior distribution in the time window from 400–500 ms from the onset of the object. No effects were observed at the verb position. We interpret it as an N400 component with a wider distribution (recall that a classical N400
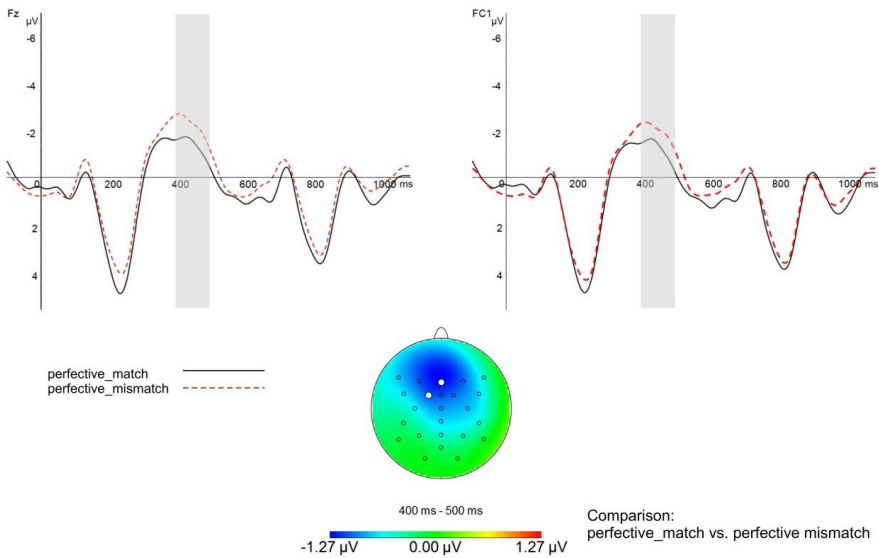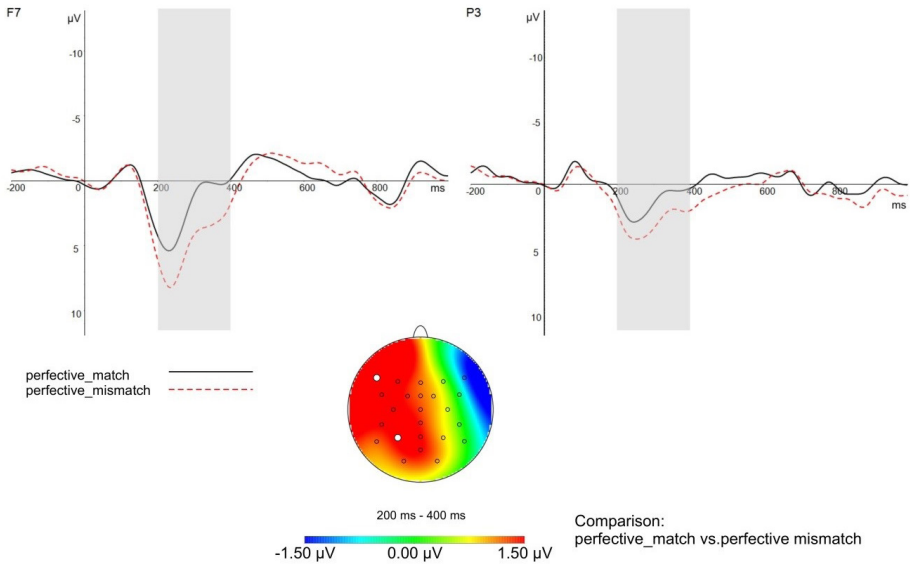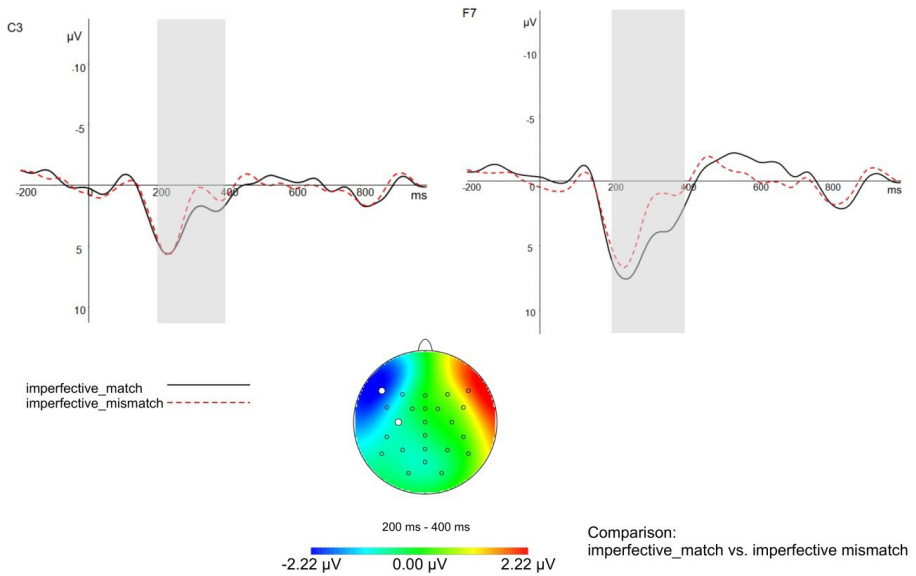
Figure 3: Comparison 4 IMPERFECTIVE_MATCH and IMPERFECTIVE_
MISMATCH. In the upper part: Grand-average ERP pattern for
the observed LAN effect on two selected electrode sites: C3 and
F7. In the lower part: Mean voltage difference maps
(IMPERFECTIVE_MISMATCH minus IMPERFECTIVE_
MATCH) for the time window from 200–400 ms.

has a centro-posterior distribution).[11] This result is compatible with our pre-
diction that the mismatch between the preverbal durative adverbial and per-
fective verb should lead to an integration problem at the (discourse) semantic
level. Our N400 component was not followed by a P600 component.

Our data were similar to the those tested in Flecken, Walbert, and Dijks-
tra (2015), who studied a mismatch between present continuous and present
simple verbs in English and the preceding temporal adverbs *right now* and
every Tuesday. They found a short-lived early negativity in the time window
(250–350ms), which was not followed by P600. Flecken, Walbert, and Dijkstra

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[11] It should be remarked that in the literature a frontal negativity (FN400) has been
reported. However, the FN400 is treated as functionally different from a classical
(centro-posterior) negativity (N400) (Bridger et al. 2012; Stróżak, Abedzadeh, and
Curran 2016, but see Voss and Federmeier 2011 for a different view). It is usually as-
sociated with some effect of "familiarity" (e.g., Bridger et al. 2012) or conceptual im-
plicit memory (Voss and Paller 2009). Thus the FN400 is not taken as a pure language
component. We would like to thank a reviewer for pointing this out.

(2015) take the early negativity to reflect the violation of a form-level expectation. However, there is an important issue that prevents us from adopting this interpretation. Namely, if our observed negativity was a reflection of a form-level expectation created by a biasing context, it should be present in both mismatching contexts with perfective and imperfective verbs, contrary to fact (see below).

In light of the fact that the observed effect was visible only on the object but not on the verb, it can be concluded that the domain of aspectual interpretation for perfective aspect in Polish is not the verb but the whole VP.

Discussion Related to Comparison 2

In Comparison 2 between Condition 3: IMPERFECTIVE_MISMATCH and Condition 4: IMPERFECTIVE_MATCH no effects were found on the verb, the object, or the following word. The lack of ERP effects is in fact compatible with the prediction that due to the semantic underspecification of an imperfective verb its meaning can be naturally adjusted to the temporal meaning of the preceding temporal adverbial. This operation does not seem to be associated with additional processing costs, which is in line with Lukassek et al. 2017.

The lack of an effect precludes a conclusion as to the domain of aspectual interpretation of imperfective aspect.

Discussion Related to Comparison 3

In Comparison 3 between Condition 1: PERFECTIVE_MISMATCH and Condition 2: PERFECTIVE_MATCH) we found a positivity in the time window from 200–400 ms from the onset of the temporal adverbial. Given the strongest left-anterior distribution of the elicited positivity, we interpret it as an early P600 with a more frontal distribution (see Friederici, Hahne, and Saddy 2002, Kutas, Van Petten, and Kluender 2006, Molinaro, Barber, and Carreiras 2011). This finding is compatible with our initial prediction that the nature of the mismatch in question is more related to a problem of structural integration than to one of semantic integration. As predicted, the ERP effect was elicited on the mismatching temporal adverbial; however, it was not a LAN but an early P600. Following Molinaro, Barber, and Carreiras 2011, we take it to reflect difficulties with the structural integration of the trigger (here: perfective aspect) and target (here: the mismatching adverbial) at the sentence level. However, it should be noted that our early P600 was visible in an earlier time window than in other studies, which also elicited this component. This might be due to the fact that a different language and different constructions were tested. Also, the interpretation of this component is a matter of dispute (see Kutas, Van Petten, and Kluender 2006 for a detailed discussion). Further

studies are needed before a stronger conclusion about the exact nature of this component can be drawn.

Discussion Related to Comparison 4

In Comparison 4 between Condition 3: IMPERFECTIVE_MISMATCH and Condition 4: IMPERFECTIVE_MATCH) we found a negativity in the time window between 200–400 ms from the onset of the temporal adverbial. Given the exclusive left-anterior distribution of this negativity, we interpret this component as a LAN. Following Molinaro, Barber, and Carreiras 2011 and Yano 2018, we take it to be an index of a violation based on detection of a mismatch with predicted features. As in Comparison 3, the elicited component reflects a more structural than (discourse) semantic integration problem.

6. General Discussion: Concluding Remarks

The goal of this paper has been to contribute to the debate on the processing of grammatical aspect (perfective and imperfective) in contexts with mismatching temporal modifiers (*w godzinę* 'in an hour' and *przez godzinę* 'for an hour'). Regarding the issue of incrementality of aspectual interpretation, the results of ERP experiments conducted on Polish suggest that the domain of aspectual interpretation of perfective aspect is a VP and not just a verb. This conclusion was based on the fact that the problems in processing perfective verbs preceded by an incongruent 'for X-time' modifier related not directly to the verb but to the object and manifested themselves in the form of an N400, which we interpret as an indicator of problems in (discourse) semantic integration. This finding is compatible with Stockall, Husband, and Beretta's (2010) view that the incremental commitment to aspectual interpretation is made once the full VP is formed and leads to the generation of a higher functional projection AspP, where aspect is computed.[12] Our results seem to contradict the conclusions of Bott and Gattnar (2015) and of Rothstein (2015), who claim that in languages that have grammatical aspect, the domain of aspectual interpretation is the verb. The difference in our results and those of Bott and Gattnar (2015) may be related to the fact that they tested perfective verbs of achievement predicates and we used perfective verbs of accomplishment predicates. Future research is needed to compare the processing of accomplishment and

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[12] A reviewer is right in pointing out that this result is counterintuitive since in Slavic languages for perfective, as opposed to imperfective, the object does not alter the temporal phasal structure of the event. However, what the result suggests is that, in purely hierarchical terms, even if the object does not alter the interpretation of perfective verbs, the parser waits for the object to form a full VP and project AspP above it because the aspectual value is computed at the level of AspP.

achievement predicates. This would probably require a different method, since in ERP studies we would need to collect at least 40 different transitive verbs of achievement, which may be challenging (if not impossible), as there is a restricted number of transitive verbs belonging to this lexical aspectual class.

In the case of imperfective aspect, no analogous ERP signature was detected on the object when the verb was preceded by a mismatching adverbial. This may suggest that with imperfective aspect, which is semantically underspecified, its interpretation can be adapted to match the semantics of the preceding temporal adverbial. The adaptation does not seem to be a costly operation as it did not elicit any ERP effect. It should be noticed, however, that the question of how easily an imperfective verb can adapt its interpretation seems to be determined by the position of a mismatching adverbial. If it follows the verb, the results suggest that the parser computes the aspectual value at AspP and commits to an interpretation. For the examples investigated the preferred interpretation is the single ongoing event reading because singular objects are used, in the absence of any other cue. This preferred aspectual value is incompatible with the following temporal adverbial, giving rise to the structural integration of the trigger (imperfective aspect) and target (the mismatching adverbial) at the sentence level.

One may wonder why the mismatch between a preceding time-span adverbial and an imperfective verb did not trigger any ERP effect, but the mismatch was rated as significantly less acceptable than the corresponding matching condition in the acceptability rating study. These seemingly contradictory results in fact do have a plausible explanation. As correctly pointed out by Yano (2018: 731), ERPs measure how costly a word or a construction is for the parser to process and not how acceptable a resulting sentence (i.e., the final representation of an entire sentence) is.

Concerning the interpretation of the ERP effects, the findings from the ERP study on Polish show that unlike in studies on languages relying predominantly on lexical aspect in the aspectual interpretation, no late sustained negativity (a working memory LAN) was found. If, as claimed by Bott (2010), Paczynski, Jackendoff, and Kuperberg (2014), and Yano (2018), a late anterior negativity reflects a tacit aspectual reinterpretation mechanism. The fact that neither perfective nor imperfective aspect elicited this component in our study suggests that a different mechanism is involved in detecting and resolving aspectual mismatches in Polish. Importantly, we observed that perfective and imperfective aspect behave differently in mismatching contexts with preverbal adverbials. Unlike imperfective aspect, perfective aspect is semantically very specific and leaves no room for contextually determined adaptation/readjustment. Independently of whether the mismatching durative 'for X-time' adverbial preceded or followed the perfective verb and its object, the parser noted this violation. This violation triggered an N400 on the object of

the perfective verb when it was preceded by a mismatching adverbial. When the perfective VP was followed by a mismatching adverbial, it gave rise to an early P600. Interestingly, while a mismatching temporal adverbial following the imperfective verb gave rise to a similar difficulty at the structural level, reflected as a LAN, no effect was observed in the imperfective condition with a preceding mismatching time-span adverbial, since in this case a tacit meaning adaptation was possible.

Taken together, our findings lend credibility to the view that the domain of aspectual interpretation in Polish is VP. Moreover, there are important asymmetries in the way perfective and imperfective verbs are processed, which can be attributed to the different degree of their semantic specificity. More specifically, only in the case of semantically underspecified imperfective verbs is the mismatch resolvable, but only when a mismatching adverbial is used preverbally. In this case, the results of our study show that the meaning of imperfective verbs can be adjusted to the meaning of the mismatching adverbial and this operation does not seem to be costly for the parser. Finally, our study shows that whereas mismatches with preverbal adverbials lead to discourse semantic integration problems (as reflected in the N400 elicited on the object in the perfective condition), mismatches with postverbal adverbials cause more structure-related integration problems (as reflected in an early P600 and a LAN component for perfective and imperfective conditions respectively).

Acknowledgements

References

Altshuler, Daniel G. (2012) "Aspectual meaning meets discourse coherence: A look at the Russian imperfective". *Journal of semantics* 29(1): 39–108.

Arregui, Ana, María Luisa Rivero, and Andrés Salanova. (2014) "Cross-linguistic variation in imperfectivity". *Natural language and linguistic theory* 32(3): 307–62.

Binnick, Robert I. (1991) *Time and the verb: A guide to tense and aspect.* New York/Oxford: Oxford University Press.

Błaszczak, Joanna and Dorota Klimek-Jankowska. (2013) "Futures, futurates, plans, and forces". Uwe Junghanns, Dorothee Fehrmann, Denisa Lenertová, and Hagen Pitsch, eds. *Proceedings of Formal Description of Slavic Lan-*

guages 9, Göttingen 2011. Frankfurt am Main: Peter Lang, 9–35. [*Linguistik international*, 28.]

Bogusławski, Andrzej. (1963) "Czasowniki dokonane niedokonane i ich stosunki wzajemne". Witold Doroszewski, ed. *Z polskich studiów slawistycznych*. Warsaw: Polska Akademia Nauk, 153–59.

Bonomi, Andrea. (1995) "Aspect and quantification". Pier Marco Bertinetto, Valentina Bianchi, James Higginbotham, and Mario Squartini, eds. *Temporal reference, aspect and actionality*. vol. 1. Torino: Rosenberg and Sellier, 93–110.

Borik, Olga. (2002) *Aspect and reference time*. Ph.D. dissertation, Utrecht University. [Published 2006 by Oxford University Press.]

Bott, Oliver. (2010) *The processing of events*. Amsterdam: John Benjamins Publishing.

————. (2016) "Can semantic theories be tested experimentally? The case of aspectual coercion". Joanna Błaszczak, Anastasia Giannakidou, Dorota Klimek-Jankowska, and Krzysztof Migdalski, eds. *Mood, aspect, modality revisited: New answers to old questions*. Chicago, IL: The University of Chicago Press, 346–80.

Bott, Oliver and Anja Gattnar. (2015) "The cross-linguistic processing of aspect: An eyetracking study on the time course of aspectual interpretation in Russian and German". *Language, cognition, and neuroscience* 30(7): 877–98. Available online: https://doi.org/10.1080/23273798.2015.1029499.

Bott, Oliver and Fritz Hamm. (2014) "Cross-linguistic variation in the processing of aspect". Barbara Hemforth, Barbara Mertins, and Cathrine Fabricius-Hansen, eds. *Psycholinguistic approaches to meaning and understanding across languages*. Cham: Springer, 83–109. [*Studies in theoretical psycholinguistics*, 44.]

Brennan, Jonathan and Liina Pylkkänen. (2010) "Processing psych verbs: Behavioural and MEG measures of two different types of semantic complexity". *Language and cognitive processes* 25(6): 777–807.

Bridger Emma K., Regine Bader, Olga Kriukova, Kerstin Unger, and Axel Mecklinger. (2012) "The FN400 is functionally distinct from the N400". *NeuroImage* 63: 1334–42. Available online: http://dx.doi.org/10.1016/j.neuroimage.2012.07.047.

Cipria, Alicia and Craige Roberts. (2000) "Spanish imperfecto and preterito: Truth conditions and aktionsart effects in a situation semantics". *Natural language semantics* 8(4): 297–347.

Comrie, Bernard. (1976) *Aspect: An introduction to the study of verbal aspect and related problems*. Cambridge: Cambridge University Press. [Reprinted 1995.]

Croft, William. (2003) *Typology and universals*. Second edition. Cambridge: Cambridge University Press.

Coulson Seana, Jonathan W. King, and Marta Kutas. (1998) "Expect the unexpected: Event related brain response to morphosyntactic violations". *Language and cognitive processes* 13: 21–58.

Dahl, Östen. (1985) *Tense and aspect systems*. Oxford: Blackwell.

de Swart, Henriëtte. (1998) "Aspect shift and coercion". *Natural language and linguistic theory* 16(2): 347–85.

Dillon Brian, Andrew Nevins, Alison C. Austin, and Colin Phillips. (2012) "Syntactic and semantic predictors of tense in Hindi: An ERP investigation". *Language and cognitive processes* 27(3): 313–44.

Ferreira, Marcelo B. (2005) *Event quantification and plurality*, Ph.D. dissertation, Massachusetts Institute of Technology.

Filip, Hana. (1993/1999) *Aspect, situation types, and noun phrase semantics*. Ph.D. dissertation, University of California at Berkeley. [Published 1999 as *Aspect, eventuality types and noun phrase semantics*. New York/London: Garland Publishing.]

———. (2017) "The semantics of perfectivity". *Italian journal of linguistics* 29(1): 167–200.

Filip, Hana and Susan Rothstein. (2006) "Telicity as a semantic parameter". James Lavine, Steven Franks, Mila Tasseva-Kurktchieva, and Hana Filip, eds. *Formal approaches to Slavic linguistics: The Princeton meeting 2005*. Ann Arbor, MI: Michigan Slavic Publications, 139–56.

Flecken, Monique, Kelly Walbert, and Ton Dijkstra. (2015) "'Right now, Sophie swims in the pool?!': Brain potentials of grammatical aspect processing". *Frontiers in psychology* 6: 1764. Available online: http://doi.org/10.3389/fpsyg.2015.01764.

Frazier, Lyn. (1999) *On sentence interpretation*. Dordrecht: Kluwer.

Friederici, Angela D. (2002) "Towards a neural basis of auditory language processing". *Trends in cognitive science* 6: 78–84. Available online: http://doi.org/10.1016/S1364-6613(00)01839-8.

Friederici, Angela D., Anja Hahne, and Douglas Saddy. (2002) "Distinct neurophysiological patterns reflecting aspects of syntactic complexity and syntactic repair". *Journal of psycholinguistic research* 31(1): 45–63.

Frisson, Steven. (2009) "Semantic underspecification in language processing". *Language and linguistic compass 3(1):* 111–27.

Gouvea Ana C., Colin Phillips, Nina Kazanina, and David Poeppel. (2010) "The linguistic processes underlying the Nina P600". *Language and cognitive processes* 25(2): 149–88.

Greenhouse, Samuel. W. and Seymour Geisser. (1959) "On methods in the analysis of profile data". *Psychometrika* 24: 95–112.

Grønn, Atle. (2003) *The semantics and pragmatics of the Russian factual imperfective*. Ph.D. dissertation, University of Oslo.

Hacquard, Valentine. (2006) *Aspects of modality*. Ph.D. dissertation, Massachusetts Institute of Technology.

Hagoort, Peter, Colin Brown, and Jolanda Groothusen. (1993) "The syntactic positive shift (SPS) as an ERP measure of syntactic processing". *Language and cognitive processes* 8: 439–83.

Husband, Matthew and Linnaea Stockall. (2015) "Building aspectual interpretation online". Roberto G. de Almeida and Christina Manouilidou, eds.

Cognitive science perspectives on verb representation and processing. Cham: Springer, 157–86.

Jasper, Herbert. H. (1958) "The ten-twenty electrode system of the International Federation". *Electroencephalography and clinical neurophysiology* 10: 371–75.

Kaan, Edith. (2007) "Event-related potentials and language processing: A brief overview". *Language and linguistics compass* 1(6): 571–91.

Kamp, Hans and Uwe Reyle. (1993) *From discourse to logic*. Dordrecht: Kluwer.

Kazanina, Nina and Colin Phillips. (2003) "Russian children's knowledge of aspectual distinctions". Barbara Beachley, Amanda Brown, and Frances Conlin, eds. *BUCLD 27 Proceedings*. Somerville, MA: Cascadilla Press, 390–401.

Klein, Wolfang. (1994) *Time in language*. London and New York, NY: Routledge.

Klimek-Jankowska, Dorota, Anna Czypionka, Wojciech Witkowski, and Joanna Błaszczak. (2018) "The time course of processing perfective and imperfective aspect in Polish—evidence from self-paced reading and eye-tracking experiments". *Acta linguistica academica: An international journal of linguistics* 65(2–3): 293–351. Available online: http://doi.org/10.1556/2062.2018.65.2–3.4.

Klimek-Jankowska, Dorota and Joanna Błaszczak (to appear). "Implications of the number semantics of NP objects on the interpretation of imperfective verbs in Polish". Mojmír Dočekal and Marcin Wągiel, eds. *Formal approaches to number in Slavic and beyond*. Berlin: Language Science Press [*Open Slavic linguistics*, anticipated 2020/2021.]

Kluender, Robert and Marta Kutas. (1993a) "Subjacency as a processing phenomenon". *Language and cognitive processes* 8: 573–633.

————. (1993b) "Bridging the gap: Evidence from ERPs on the processing of unbounded dependencies". *Journal of cognitive neuroscience* 5: 196–214.

Kratzer, Angelika. (1998) "More structural analogies between pronouns and tenses". Devon Strolovitch and Aaron Lawson, eds. *Semantics and linguistic theory 8*. Ithaca, NY: CLC Publications, 92–110.

Krifka, Manfred. (1992) "Thematic relations as links between nominal reference and temporal constitution". Ivan A. Sag and Anna Szabolcsi, eds. *Lexical matters*. Stanford, CA: CSLI, 29–53.

Kutas, Marta, Cyma K. Van Petten, and Robert Kluender. (2006) "Psycholinguistics electrified 2: 1994–2005". Matthew J. Traxler and Morton A. Gernsbacher, eds. *Handbook of psycholinguistics*. 2nd edition. New York, NY: Elsevier, 659–724.

Laskowski, Roman. (1984) "Kategorie morfologiczne języka polskiego—charakterystyka funkcjonalna". Renata Grzegorczykowa, Roman Laskowski, and Henryk Wróbel, eds. *Gramatyka współczesnego języka polskiego—Morfologia*. Warsaw: Wydawnictwo PWN, 121–69.

Lawrence, Michael A. (2016) ez: Easy analysis and visualization of factorial experiments. R package version 4.4-0. Available online: https://CRAN.R-project.org/package=ez.

Lenci, Alessandro and Pier Marco Bertinetto. (2000) "Aspect, adverbs, and events: Habituality vs. perfectivity". James Higginbotham, Fabio Pianesi, and Achille C. Varzi, eds. *Speaking of events*. Oxford/New York, NY: Oxford University Press, 245–87.

Lukassek, Julia, Anna Prysłopska, Robin Hörnig, and Claudia Maienborn. (2017) "The semantic processing of motion verbs: Coercion or underspecification?". *Journal of psycholinguistic research* 46(4): 805–25.

Marlsen-Wilson, William and Lorraine Tyler. (1980) "The temporal structure of spoken language understanding". *Cognition* 8(1): 1–71.

Molinaro, Nicola, Horacio A. Barber, and Manuel Carreiras. (2011) "Grammatical agreement processing in reading: ERP findings and future directions". *Cortex*, 47(8): 908–30. Available online: http://dx.doi.org/10.1016/ j.cortex.2011.02.019.

Nagórko, Alicja. (1998) *Zarys gramatyki polskiej (ze słowotwórstwem)*. Warsaw: Wydawnictwo PWN.

Oldfield, R. Carolus. (1971) "The assessment and analysis of handedness: The Edinburgh inventory". *Neuropsychologia* 9: 97–113.

Osterhout, Lee and Phillip J. Holcomb. (1992) "Event-related brain potentials elicited by syntactic anomaly". *Journal of memory and language* 31: 785–806.

Paczynski, Martin, Ray Jackendoff, and Gina Kuperberg. (2014) "When events change their nature: The neurocognitive mechanisms underlying aspectual coercion". *Journal of cognitive neuroscience* 26(9): 1905–17. Available online: http://doi.org/10.1162/jocn_a_00638.

Padučeva, Elena V. (1996) *Semantičeskie Issledovanija: Semantika vremeni i vida v russkom jazyke. Semantika narrativa*. Moscow: Jazyki russkoj kul'tury.

Paslawska, Alla and Arnim von Stechow. (2003) "Perfect readings in Russian". Artemis Alexiadou, Monika Rathert, and Armin von Stechow, eds. *Perfect explorations*. Berlin: Mouton de Gruyter, 307–62.

Pickering, Martin J., Brian McElree, Steven Frisson, Lillian Chen, and Matthew J. Traxler. (2006) "Underspecification and aspectual coercion". *Discourse processes* 42(2): 131–55.

Pickering, Martin J. and Steven Frisson. (2001) "Processing ambiguous verbs: Evidence from eye movements". *Journal of experimental psychology: Learning, memory, and cognition* 27(2): 556–73.

Piñango, Maria Mercedes, Aaron Winnick, Rashad Ullah, and Edgar Zurif. (2006) "Time-course of semantic composition: The case of aspectual coercion". *Journal of psycholinguistic research* 35(3): 233–44.

Piñango, Maria Mercedes, Edgar Zurif, and Ray Jackendoff. (1999) "Real-time processing implications of enriched composition at the syntax-semantics interface". *Journal of psycholinguistic research* 28: 395–414.

R Development Core Team. (2016) *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing.

R Development Core Team. (2020) *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing.

Reichenbach, Hans. (1947) *Elements of symbolic logic*. New York, NY: Macmillan.

Rösler, Frank, Thomas Pechmann, Judith Streb, Brigitte Röder, and Erwin Hennighausen. (1998) "Parsing of sentences with varying word order: Word-by-word variations of processing demands are revealed by event-related brain potentials". *Journal of memory and language* 38: 150–76.

Rothstein, Susan. (2015) "Some contrasts between aspectual operators in English and Slavic". Paper presented at Grammaticalization and language change, Formal Description of Slavic Languages 11, Potsdam, December 2–4, 2015.

Śmiech, Witold. (1971) *Funkcje aspektów czasownikowych we współczesnym języku ogólnopolskim*. Wrocław: Zakład Narodowy im. Ossolińskich.

Smith, Carlota S. (1997) *The parameter of aspect*. Dordrecht: Kluwer.

Stockall, Linnaea, E. Matthew Husband, and Alan Beretta. (2010) "The online composition of events". *Queen Mary's OPAL #19 Occasional Papers Advancing Linguistics*: 1–32.

Stróżak, Paweł, Delora Abedzadeh, and Tim Curran. (2016) "Separating the FN400 and N400 potentials across recognition memory experiments". *Brain research* 1635: 41–60. Available online: http://dx.doi.org/10.1016/j.brainres.2016.01.015.

Szwedek, Aleksander. (1998) "English resultant, affected and eventive objects in Polish grammar". *Studia Anglica Posnaniensia* 33: 411–19.

Todorova, Marina, Kathy Straub, William Badecker, and Robert Frank. (2000) "Aspectual coercion and the online computation of sentential aspect". Lila R. Gleitman and Aravind K. Joshi, eds. *Proceedings of the 22nd Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Lawrence Erlbaum Associations, 3–8.

Venables, William and Brian Ripley. (2002) *Modern applied statistics with S*. 4th edition. New York: Springer.

Voss, Joel L. and Kara D. Federmeier. (2011) "FN400 potentials are functionally identical to N400 potentials and reflect semantic processing during recognition testing". *Psychophysiology* 48(4): 532–46. Available online: http://doi.org/10.1111/j.1469-8986.2010.01085.x.

Voss Joel L. and Ken A. Paller. (2009) "An electrophysiological signature of unconscious recognition memory". *Nature neuroscience* 12(3): 349–55. Available online: http://doi.org/10.1038/nn.2260.

Wierzbicka, Anna. (1967) "On the semantics of verbal aspect in Polish". *To honor Roman Jakobson: Essays on the occasion of his seventieth birthday*, vol. 3. The Hague: Mouton, 2231–49.

Willim, Ewa. (2006) *Event, individuation, and countability. A study with special reference to English and Polish*. Kraków: Jagiellonian University Press.

Wróbel, Henryk. (1999) "Czasownik". Renata Grzegorczykowa, Roman Laskowski, and Henryk Wróbel, eds. *Gramatyka współczesnego języka polskiego*. Volume 2: *Morfologia*. Warsaw: Wydawnictwo Naukowe PWN, 536–84.

Wróbel, Henryk. (2001) *Gramatyka języka polskiego* [The grammar of Polish]. Kraków: Od Nowa.

Yano, Masataka. (2018) "Predictive processing of aspectual information: Evidence from event-related brain potential". *Language, cognition, and neuroscience* 33(6): 718–33. Available online: http://doi.org/10.1080/23273798.2017.1416150.

Zhang, Yaxu and Jingting Zhang. (2008) "Brain responses to agreement violations of Chinese grammatical aspect". *NeuroReport* 19(10): 1039–43.

Zinova Yulia. (2016) *Russian verbal prefixation: A frame semantic analysis.* Ph.D. dissertation, Heinrich-Heine-University.

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Appendix

Below is the list of the imperfective and perfective verbs (in their infinitival forms) and their objects that was used in Experiments 1 and 2.

otwierać/otworzyć zamek	to unlock$_{IPFV/PFV}$ lock
myć/umyć stół	to wash$_{IPFV/PFV}$ table
przeglądać/przejrzeć tekst	to brows$_{IPFV/PFV}$ text
studiować/przestudiować manuskrypt	to examine$_{IPFV/PFV}$ manuscript
analizować wynik/przeanalizować wynik	to analyze$_{IPFV/PFV}$ results
czytać/przeczytać rozdział	to read$_{IPFV/PFV}$ chapter
zmieniać/zmienić wstęp	to change$_{IPFV/PFV}$ introduction
badać/zbadać teren	to explore$_{IPFV/PFV}$ terrain
pić/wypić sok	to drink$_{IPFV/PFV}$ juice
formułować/sformułować wniosek	to formulate$_{IPFV/PFV}$ conclusion
pisać/napisać list	to write$_{IPFV/PFV}$ letter
przyprawiać/przyprawić sos	to season$_{IPFV/PFV}$ sauce
czyścić/wyczyścić samochód	to clean$_{IPFV/PFV}$ car
odkurzać/odkurzyć pokój	to vacuum$_{IPFV/PFV}$ room
przyszywać/przyszyć guzik	to sew (on)$_{IPFV/PFV}$ button
kosić/skosić trawnik	to mow$_{IPFV/PFV}$ lawn
przygotowywać/przygotować obiad	to prepare$_{IPFV/PFV}$ dinner
zamykać/zamknąć garaż	to close$_{IPFV/PFV}$ garage
prasować/wyprasować obrus	to iron$_{IPFV/PFV}$ tablecloth
prać/wyprać ręcznik	to wash$_{IPFV/PFV}$ towel
naprawiać/naprawić rower	to repair$_{IPFV/PFV}$ bike
tynkować/otynkować dom	to plaster$_{IPFV/PFV}$ house
remontować/wyremontować dach	to haul$_{IPFV/PFV}$ roof
parkować/zaparkować wóz	to park$_{IPFV/PFV}$ car

malować/pomalować płot	to paint$_{IPFV/PFV}$ fence
niszczyć/zniszczyć dokument	to destroy$_{IPFV/PFV}$ document
wstrzykiwać/wstrzyknąć lek	to inject$_{IPFV/PFV}$ medicine
podlewać/podlać ogród	to water$_{IPFV/PFV}$ garden
zmazywać/zmazać napis	to erase$_{IPFV/PFV}$ text
wyrywać/wyrwać krzew	to pluck$_{IPFV/PFV}$ bush
zasłaniać/zasłonić kadłub	to cover$_{IPFV/PFV}$ hull
skrapiać/skropić makowiec	to sprinkle$_{IPFV/PFV}$ poppyseed cake
przykrywać/przykryć tapczan	to cover$_{IPFV/PFV}$ bed
przesiewać/przesiać żwir	to sieve (through)$_{IPFV/PFV}$ gravel
brudzić/ubrudzić ganek	to dirty$_{IPFV/PFV}$ porch
piec/upiec sernik	to bake$_{IPFV/PFV}$ cheesecake
wiercić/wywiercić otwór	to drill$_{IPFV/PFV}$ hole
rozprowadzać/rozprowadzić barwnik	to distribute$_{IPFV/PFV}$ colour
rozczesywać/rozczesać warkocz	to uncomb$_{IPFV/PFV}$ braid
zakładać/założyć spodnie	to put (on)$_{IPFV/PFV}$ trousers

Reviews

Tatyana G. Slobodchikoff. *The evolution of the Slavic dual: A biolinguistic perspective*. Lanham, MD: Lexington Books (an imprint of Rowman & Littlefield), 2019. 212 pp. [*Studies in Slavic, Baltic, and Eastern European Languages and Cultures*.] ISBN 978-1-4985-7924-7 (hardback), 978-1-4985-7925-4 (eBook).

Reviewed by Boštjan Dvořák

Indo-European comparative grammar offers many fascinating and complex language phenomena for synchronic and diachronic analysis. The dual number is undoubtedly one of the most puzzling and intensively discussed items among these. Almost all ancient IE languages had a dual in addition to singular and plural. But most of the modern languages have lost their dual in the course of their history; no IE language has gained a new dual. In the book under review, Tatyana G. Slobodchikoff gives a methodologically highly elaborated presentation and excellent analysis of how this grammatical category must have developed in the Slavic language group from a prehistoric stage through to the modern spoken languages, drawing on a large set of IE and non-IE languages for comparison. We see it as both a thrilling scholarly read and an indispensable example of methodology for many other fields of analytic language science.

Starting with a panoramic overview of the grammatical category of dual in a general perspective against a background of typology and universals, the author passes to a selection of sources from the newer history of Slavic languages. She focusses on these and considers them in the light of several insightful theoretical approaches—Humboldt 1827, Jespersen 1965, Plank 1989, Corbett 2000, Cysouw 2009—followed by a thorough step-by-step analysis and explanation of the difficult, apparently unsolvable and paradoxical linguistic problem of why the dual number is conserved in just a few of the contemporary Slavic languages while it has been entirely lost in the rest of them under seemingly identical conditions. Her new account involves a reinterpretation of Chomsky's concept of language as a biological and economic organism (Chomsky 2005, 2008 etc.), constantly changing with the purpose of improving its system of grammatical relations, oppositions, and rules, proceeding

from a given stage to another that appears to speakers to be as consistent and appropriate as possible.

If we analyze the early Slavic system of singular/dual/plural as [+singular –augmented], [–singular –augmented], and [–singular +augmented] respectively (p. 114), the dual turns out to be the most marked. This excess of markedness can simply be eliminated by "impoverishment", as most of the Slavic languages have done in creating their singular vs. plural systems. Or it can become less marked as a "reanalyzed dual" through the principle of Morphosyntactic Feature Economy, yielding [–singular] [–augmented] expressed by two separate exponents (p. 115ff). Upper and Lower Sorbian add *-j* to their dual forms, and Slovenian adds *dva* 'two' to its inherited dual pronouns (e.g., *ona > onadva*). Therefore, as excellently demonstrated by Slobodchikoff, the different final results in the respective languages—a full three-number-system (singular, dual, and plural) in pronominal, verbal, and nominal inflexion in Slovenian and Lower and Upper Sorbian, opposed to the reduced two-number-system (singular and plural) of the pronouns, nouns and verbs in Old East Slavic and Kashubian—are due to the same driving wheel of change, the gradual appearance of a syncretism in a group of personal pronouns, as can be traced mainly to the 2nd and 1st person forms for dual and plural number, inherited from the well documented, common former language stages. Against the background of the universal rule of systematization, speakers using the respective idiom are forced to reinterpret the asymmetry of the deficient system, and to either add or remove the critical forms in order to repair it. Thus, the tendency for systematization can be considered as the motivating force of almost any step of change within a language system—with irregularities revealing remnant elements of former stages of a changing whole, at the same time usually causing its "improvement", the direction and extent of which depend on the interpretation by the speakers.

The methodical fidelity to Chomsky's principle of biological economy can lead, as excellently shown by the author, to convincing and fruitful results, confirming it as a reliable approach to understand language change. At those few points where this is not possible—because a language is, in fact, not really just an independent system, but rather dependent on quite a large set of social, psychological, political, historical, and even fashion-like external factors—Slobodchikoff is able to offer an elegant, convincing explanation of how the aforementioned motivating difference could have arisen from the decisive fact that the translation of the Bible, occurring at different points of time in the respective languages, met the systems in different stages of susceptibility to influence by foreign grammatical examples.

For its clear, consistent methodology, enriched with significant numbers of convincing and original proposals, this inspiring, well-structured monograph is highly recommendable as a reading on the synchrony and diachrony

of linguistic science as well as a stimulus for research and a helpful manual for linguistics students.

Some misprints should be noted: Page 7, 15, 16 etc.: Doldoserbski and Doldoserbšćina should be Dolnoserbski and Dolnoserbšćina. Page 50, Mon-Kher > Mon-Khmer. Page 77, Derdanc > Derganc. Page 94, example (66), the gloss should be 'You two have said.' In example (67), 3. *oni-dva* should be 3. *ona-dva*. Page 99, the 'three persons' should be 'first, second, and third'. Page 121ff., Dalmatian > Dalmatin. Page 123, example (115): "1 Mr 4.8" should be "1 Mz [i.e., Genesis] 4.8." Page 128, example (129): "We two have said." > "You two have said." Page 131, "is the elsewhere items whose context in" > "in the elsewhere items whose context is". Page 142, "Protestantism in Slovenia and Sorbian" should apparently be "...Slovenia and Lusatia" (or "Slovenian and Sorbian"?).

References

Chomsky, Noam. (2005) "Three Factors in Language Design". *Linguistic inquiry* 36(1): 1–22.

————. (2008) "Approaching UG from Below". Uli Sauerland and Hans-Martin Gärtner, eds. *Interfaces + Recursion = Language?: Chomsky's Minimalism and the view from syntax-semantics*. Berlin: Mouton de Gruyter, 1–29.

Corbett, Greville G. (2000) *Number*. Cambridge: Cambridge University Press.

Cysouw, Michael. (2009) *The paradigmatic structure of person marking*. Oxford: Oxford University Press.

von Humboldt, Wilhelm. (1827) "Űber den Dualis: Gelesen in der Akademie der Wissenschaften am 26. April 1827". *Abhandlungen der Königlichen Akademie der Wissenschaften in Berlin*. Philosophisch-historische Klasse: 161–87. [Many later reprints, e.g., online at: https://www.biodiversitylibrary.org/item/93802#page/715/mode/1up.]

Jespersen, Otto. (1965) *The philosophy of grammar*. New York: W.W. Norton & Company.

Plank, Frans. (1989) "On Humboldt on the dual". Roberta Corrigan and Michael Noonan, eds. *Linguistic categorization*. Amsterdam: John Benjamins, 293–333.

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Andrii Danylenko and Motoki Nomachi, eds. *Slavic on the language map of Europe: Historical and areal-typological dimensions*. Berlin and Boston: De Gruyter Mouton, 2019, 498 pp. [*Trends in Linguistics. Studies and Monographs*, 333].

Reviewed by Jasmina Grković-Major

This book is largely based on the papers presented at the International symposium *Slavic on the Language Map of Europe*, held in 2013 at the Slavic-Eurasian Research Center of Hokkaido University in Sapporo (Japan), a renowned center for Slavic studies that promotes international cooperation in the field of linguistics. Besides the introductory article by Andrii Danylenko, "Searching for a place of Slavic in Europe as a linguistic area" (1–17), it consists of 14 contributions, grouped into three parts: "Issues in methodology and pre-history" (19–110), "Slavic and Standard Average European" (111–258), and "Slavic in areal groupings in Europe" (259–489), followed by an Index of subjects (491–94) and an Index of languages (495–98).

Part I encompasses three chapters. In "Matrëška and areal clusters involving varieties of Slavic: On methodology and data treatment" (21–61), Björn Wiemer questions not only the notion of Slavic ("What does 'Slavic' (type) mean?"), but the very notion of taxonomies, definitions of areal clines, hotbeds of diffusion, and language types, raising an important question: what if we change the criteria (feature clusters) that underlie them? Examining several case studies (resultatives and related constructions, reflexive-reciprocal polysemy, etc.), Wiemer shows that the diversification of Slavic varieties is a result of language contacts that promote minor usage patterns and points out that the inclusion of diastratic diversification (often neglected in discussions not only of Slavic but of Standard Average European (SAE) features as well) shows that Slavic is by no means "a monolithic or easily definable notion". By doing so, the study also brings into question the Sapirian notion of drift.

"Common Slavic in the light of language contact and areal linguistics: Issues of methodology and the history of research" by Vít Boček (63–86) deals with areal linguistics, language contact studies, and diachronic linguistics. The author presents three approaches to language contacts in historical-comparative linguistics: conventional (the main role in language development is played by language divergence and no role or a minor role for language convergence), revisionist (divergence and convergence balanced), and revolutionary (mainly language convergence). He presents the application of these

approaches to the analysis of contacts between Common Slavic and early Romance dialects, emphasizing that these contacts, which involve some convergent phonological features, are not a matter of source language and target language but rather of "mutual reinforcement".

In "Intertwining trees, eddies, and tentacles—some thoughts on linguistic relationships in Europe, mainly Slavic-non-Slavic" (87–110), Robert Orr first presents a complex historical picture of multi-level linguistic relations in Europe, including non-Indo-European families such as Old European, Hamito-Semitic, and Uralic. Focusing on SAE, he points out, following Isačenko, that an important aspect in the study of the SAE languages is their division into *have*-languages and *be*-languages. He further discusses family trees, the center-periphery relation, substratum theories, "linguistic rings", and Hungarian.

Part II opens with a contribution by Jadranka Gvozdanović, "Standard Average European revisited in the light of Slavic evidence" (113–44). She examines several grammatical properties of SAE in light of Slavic data: the article, relative clauses, possession, and the *habeo*-perfect. She shows that these changes were slow and some were "adaptive changes that do not really modify the system". For example, while Bulgarian and Macedonian as members of the Balkan Sprachbund developed articles, language contact led to the increased use of demonstrative pronouns in Czech, Polish, Sorbian due to German influence. Finally, Gvozdanović elaborating on the historical dimension of SAE argues that its origins are likely to be older than usually presumed since some of the SAE features are attested earlier and have wider distribution (e.g., relative clauses with relative pronouns). Although these features, as she argues, could have been based on the common Indo-European ancestry of the SAE languages, Bible translations and Vulgar Latin played an important role in their grammaticalization.

In the next chapter, "The perfects of Eastern 'Standard Average European': Byzantine Greek, Old Church Slavonic, and the role of roofing" (145–85), Bridget Drinka analyzes the Greek influence on Old Church Slavonic participle constructions, including periphrastic constructions, and focuses on the OCS perfect. She presents two chronological layers in its development: the archaic one with non-durative *l*-forms and the innovative one with durative *l*-forms. The perfect is also analyzed as a link between aspect tense and viewpoint aspect, concluding that its semantic broadening influenced an aspectual system based on affixation. Drinka states that the development of the Slavic perfect supports the dichotomous character of SAE (east SAE : west SAE), pointing to the role of the "roof" languages, Greek and Latin respectively, connected to the division between Greek Orthodoxy and Roman Catholicism.

"Slavic vis-à-vis Standard Average European: An areal-typological profiling on the morphosyntactic and phonological levels" by Nataliya Levkovych, Lidia Federica Mazzitelli, and Thomas Stolz (187–223) analyzes two structural

phenomena in Slavic. The first one is the encoding of two non-prototypical possessive relations: body-part possession and possession of diseases. In their in-depth analysis, the authors show that the Slavic languages are "perfectly integrated in the European landscape". The second feature is a phonological one—the so-called secondary articulation (labialization, palatalization, velarization, etc.). Again, the authors show that Slavic "behaves rather similarly to other European languages". In both cases, they analyze the problem in a broader, Indo-European and non-Indo-European context, and also point to the importance of areal factors, which, for example, led to the split in predicative possession. As they state, it is clear that the "division of Europe into two halves is much fuzzier than previously assumed", since "both phenomena show a clear center-periphery distribution of the isoglosses". This important conclusion will surely inspire further investigation of various phenomena, which might redefine the boundaries of SAE.

The importance of Yiddish is elaborated in the chapter "How Yiddish can recover covert Asianisms in Slavic, and Asianisms and Slavisms in German (prolegomena to a typology of Asian linguistic influences in Europe)" by Paul Wexler (225–58). He defines Yiddish as an Iranianized Slavic language, claiming also that the Ashkenazi Jews are basically the descendants of Slavic, Iranian, and Turkic converts to Judaism, which formed a Slavo-Irano-Turkic confederation. By exploring the nature of bilingualism in such confederations and identifying Iranianisms and Slavisms in German and Iranianisms in Slavic, as well as Turkic elements in Slavic and German, he elaborates on the importance of Yiddish for Slavic and German linguistics.

Part III opens with "Defining the Central European convergence area" by Helena Kurzová (261–89) The Central European convergence area (CE) is seen as a Sprachbund, consisting of Indo-European (Germanic and Slavic) and non-Indo-European (Finno-Ugric) languages. The preconditions for its formation were the same as in other Sprachbunds—a continuous period of bilingual and multilingual communication, with German being a language transmitting the SAE traits to CE. Kurzová focuses on morphosyntactic features of CE (preverbation, simple system of past tenses, ingressive periphrastic future, etc.), since they, as she points out, testify to a deeper convergence level. She analyzes these features in the context of SAE and compares CE with the Balkan Sprachbund.

In "Some morpho-syntactic features of the Slavic languages of the Danube Basin from a pan-European perspective" (291–313) George Thomas deals with several characteristics of the Slavic languages in Central Europe (those of the Danube Basin), in order to investigate their possible participation in the innovations attributed to SAE: the definite and indefinite articles, the periphrastic future, the perfect as the sole preterite, the supercompound pluperfect, and the three-tense system. Emphasizing "the need for areal typology to give more attention to non-standard varieties", he presents data from dialects

(and standard languages as well), shows the existence of the same trends in the languages investigated as in SAE, and proposes that Central European Slavic represents a transitional area to other Slavic languages. This leads him to the conclusion that the borders of SAE should be reconsidered.

Another, convergence area that includes Slavic is discussed by Andrey N. Sobolev in "Slavic dialects in the Balkans: Unified and diverse, recipient and donor" (315–45). Sobolev reports on the current state of research on the Balkan Sprachbund. He discusses terminology, especially the naming and division of languages/dialects, research methods, tasks, among which the main ones are to identify "the linguistic constants of the Balkan Peninsula", the question of South Slavic in relation to Proto-Slavic, Balkan Slavic as a member of the Balkan Sprachbund, and the division of the Balkan Sprachbund into the western and the eastern group of dialects. Finally, he examines Slavic in the Balkans as a donor and as a recipient system and explains determinants that enable or facilitate contact-induced changes, both in grammar and lexicon. The categories that "show strong borrowability restrictions" are labeled "antibalkanisms".

A fresh look on the relation between Carpathianisms and Balkanisms in the Carpathian-Balkan macroarea is offered by Andrii Danylenko in "Balkanisms and Carpathianisms or, Carpathian Balkanisms?" (347–83). The author gives a critical review of the hypotheses concerning the linguistic features of the Balkan and Carpathian area and advocates for a threefold approach—areal, genetic, and typological (sociolinguistic) in studying them. The importance of the genetic aspect, often ignored in areal studies, might lead to simplified, if not wrong, conclusions, as shown in his deconstruction of what are known as primary Carpathian Balkanisms: dative enclitic pronouns, analytic comparative formations, derivation of numerals 11–19, the de-volitive future, the use of an uninflected relativizer, and the merger of goal and location in *de*. For example, it is shown that the location model 'one on ten' in the derivation of numerals 11–19 is not a Balkanism or Carpathian Balkanism since it is an inherited Slavic model. In explaining the rise of the so-called Carpathianisms and Balkanisms, Danylenko stresses the importance of the configuration of societal factors ("external determinant"), which "preconditions the shaping of an 'internal determinant' defined as a principal feature optimizing the whole system of a particular language system"—being a step between multilingual contact and replication.

"Morphosyntactic changes in Slavic micro-languages: The case of Molise Slavic in total language contact" by Walter Breu (385–432) is devoted to Molise Slavic, a Slavic micro-language spoken in Italy, which, after its speakers moved from the Balkans to Italy some 500 years ago, has been in a situation of total language contact with Romance varieties. Breu discusses its contact-induced morphosyntactic and syntactic features: the categories of tense, aspect, and mood, the categories of case, gender, and declension, number, definiteness,

the category of comparison of adjectives and adverbs, the position of attributes, the position of clitics, double negation, and object doubling. He explores these changes in the light of an interplay of Slavic and Romance "diachronic constants", showing that the language contact also led to the overriding of Slavic constants, as shown, for example, by the loss of the aorist instead of the imperfect. Finally, Breu argues that, due to these contact-induced changes, Molise Slavic "came closer to the nucleus of SAE".

Also dealing with Molise Slavic is "On formulas of equivalence in grammaticalization: An example from Molise Slavic" by Bernd Heine (433–51). The author takes the example of the Molise Slavic indefinite article to discuss the "formula of translation equivalence between the discourse structures of the languages concerned" as an important force in contact-induced grammatical change. Defining these formulas as value equations between structures of the languages in contact made by speakers, Heine points to their importance in grammaticalization, assuming that a degree of "semantic relationship" plays an important role in this process, in the sense that higher semantic closeness implies higher chances for grammaticalization. An analogous explanation is offered for "polysemy copying". In conclusion, it is stated that Molise Slavic, although it made substantial steps towards SAE, "has retained an overall Slavic typological profile".

In the concluding chapter, "Placing Kashubian on the language map of Europe" (453–89), Motoki Nomachi analyzes the dynamics of five relevant morphosyntactic areal features of Kashubian: the definite and indefinite articles, the *have*-perfect, the negative pronouns and lack of verbal negation, the subject person affixes as strict agreement markers, and the comitative-instrumental syncretism. In order to capture the course of changes in the history of Kashubian, he obtained his material not only from the previous studies of the language but also by his own fieldwork, which provided him with the "living tissue" of the language—dialect data. Applying a multifaceted approach, which includes not only areal, typological, and contact linguistics, but a diachronic viewpoint as well, Nomachi offers a detailed analysis of the phenomena in question. He shows how the changes have been dependent on the contact situation. Between the 19th and the first half of the 20th century, Kashubian was acquiring the non-Slavic SAE features due to its close contacts with German, but with significant variation in the level of grammaticalization: for example, while the *have*-perfect was grammaticalized, the lack of negative concord is only marginally found in some dialects. The situation changed after World War II when German influence ceased and Polish became the main force inducing changes in Kashubian, leading to the degrammaticalization of "German features" and moving it "from the core of SAE to its periphery".

Slavic on the Language Map of Europe: Historical and Areal-Typological Dimensions is a valuable addition to Slavic linguistics, as well as to contact and areal linguistics in general. Based on solid empirical data, it offers fresh insights

into the areal-typological profile of Slavic as a member of several linguistic areas in Europe: SAE, the Balkan Sprachbund, the Central European convergence area, and the Carpathian-Balkan linguistic macroarea, thus providing a holistic view of Slavdom in this respect. It not only offers answers but also opens questions and challenges some widely held views concerning, for example, the place of Slavic within SAE or its division into east and west. The authors' conclusions are not always unanimous, but this is more than welcome when dealing with an area still open to investigation. Moreover, the chapters presented here contribute, both theoretically and methodologically, to a deeper understanding of the nature of language contact and various sociolinguistic factors that enable and induce grammaticalization, in an interplay of internal and external linguistic determinants.

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Roman Jakobson. *Remarks on the phonological evolution of Russian in comparison with the other Slavic languages*. Tr. by Ronald F. Feldstein. Cambridge, MA and London: The MIT Press, 2018. xxiv + 215 pp. ISBN 9780262038690.

Reviewed by Ronald I. Kim

During the 1920s and 1930s, in the capital of the newly independent Czecho-slovak Republic, a Russian émigré and his associates produced a wealth of such innovative studies on the workings of human language that today, nearly a century later, their influence continues to be felt across a range of disciplines. Roman Jakobson, together with his compatriot Nikolai Trubetzkoy, was the central figure in the Prague Linguistic Circle, which built upon the insights of Ferdinand de Saussure to make lasting contributions to structuralist linguistics, poetics, and literary theory. Jakobson's impact on fields such as linguistic anthropology and semiotics remains palpable down to the present, and his theory of distinctive features and understanding of linguistic changes not as isolated events, but as changes to whole systems inspired many leading minds of the postwar generation, from Noam Chomsky and Morris Halle, the founders of generative linguistics, to Uriel Weinreich and William Labov, who pioneered the study of language in its social context. Many of his observations were drawn from Russian and other Slavic languages, of which Jakobson had a legendary command, establishing his enduring status as a towering figure of Slavic studies.

Jakobson is mostly known among linguists today for his postwar publications written in English, which along with his prewar œuvre are collected in the nine-volume *Selected writings* (Jakobson 1962–2014). The first of these contains the work under review, the second monograph composed by Jakobson after his celebrated study of Russian and Czech poetics (Jakobson 1923). But whereas the latter was printed and remains available in the original Russian, *Remarks* suffered a less fortunate fate: after the Russian manuscript was destroyed in 1939 during the German occupation of Brno, it survived only in the French translation of Louis Brun, published in Prague in 1929 as the second volume of the *Travaux du Cercle Linguistique de Prague*. The precipitous decline in knowledge of French among Slavicists (and linguists at large) has had the consequence that this major achievement of Jakobson's Prague years has tended to be somewhat overlooked, its analyses often known from citations in Jakobson's later publications.

The present edition owes its appearance to the efforts of Ronald F. Feldstein, a leading figure in Jakobsonian linguistics who has written extensively on many of the topics addressed in *Remarks*. Feldstein, who also collaborated on the translation of V. M. Illič-Svityč's classic *Nominal accentuation in Baltic and Slavic* (1979), has skillfully rendered Brun's French into idiomatic English academic prose, while striving to maintain (and, in select instances, restore) as much as possible of the sense of the lost Russian original. Given Jakobson's famously terse prose and the complexity of the concepts discussed, Feldstein has wisely decided to include annotations following each chapter, rather than after each section or all together at the end; this arrangement greatly facilitates the reader's task, without unduly interrupting the flow of the text.

The volume begins with a foreword by Feldstein placing *Remarks* in the context of Jakobson's scholarship (xiii–xvii) and orientational "Notes on Early Common Slavic to Late Common Slavic" (xix–xxi), followed by Jakobson's own preface (xxiii). The first two chapters, "Basic principles" (1–8; Feldstein's annotations 9–13) and "Remarks on current issues of comparative historical phonology" (15–21; 22–24), introduce the main concepts used throughout the rest of the study, including phonemes, phonological correlations and disjunctions, archiphonemes, the relation between synchrony and diachrony, and "laws" linking correlations in phonological change. Chapter 3 is devoted to "Remarks on the evolution of the phonological system of Proto-Slavic" (25–43; 44–57), focusing on the palatalization of consonants and treatment of diphthongs as crucial events in the trend toward rising sonority and syllabic synharmony.

Jakobson then turns to a perennial problem of Slavic historical phonology in Chapter 4, "The Proto-East-Slavic change of initial *je-* to *o-* and similar developments in the other Slavic languages" (59–66; 67–69). After a brief overview of "Dialectal facts about Proto-East-Slavic" (Chapter 5: 71–73; 74–75), he explores the "Consequences of the loss of weak jers for the Slavic languages" (Chapter 6: 77–88; 89–97), including West Slavic and South Slavic as well as East Slavic. Chapter 7, along with Chapter 3 the longest in the book, explores "The establishment of the 'soft ~ hard consonant' correlation in Russian and other Slavic languages, and related facts" (99–117; 118–33), with detailed discussions of dialectal Ukrainian, Belarusian, and Russian developments. Chapter 8 briefly reviews "Features common to Russian and absent in other East Slavic dialects" (135–37; 138–40), and Chapter 9 analyzes the many complex "Russian dialect changes of unaccented vowels", collectively known as *akan'e* and *jakan'e* (141–52; 153–58). Chapter 10 summarizes Jakobson's conclusions on the systematic nature of linguistic change and spread of innovations, and his affirmation of structural linguistics as a reflection of a wider trend in the art and social sciences of the interwar period (159–65; 166–68).

There follow three extremely useful appendixes by Feldstein: a guide to Jakobson's system of transcription (169), the transliteration of Cyrillic adopted

in this edition (171–76), and an overview with vowel charts of major *jakan'e* types in East Slavic dialects (177–84). Bibliographical references to Jakobson's text (185–90) and Feldstein's annotations (191–93), Jakobson's footnotes (195–203), and a well-organized index (205–15) round out the book.

Having been (like Feldstein) introduced to Slavic linguistics by an ad-herent of the Jakobsonian school, the late Charles Townsend, this reviewer is well aware of the near reverence in which Jakobson continues to be held by many in the field. However, the 90 years since the publication of *Remarks* have witnessed an explosion of empirical data on language acquisition and change and the rise of new theoretical frameworks, from generative grammar to so-ciolinguistics to typology. As a result, many of Jakobson's views on phono-logical change and the relation between linguistic synchrony and diachrony have fallen out of favor. Moreover, for all its pioneering quality at the time, *Remarks* can scarcely be termed "one of the best and most detailed treatments of the events that transformed Late Common Slavic into the separate Slavic languages" (xix), given the innumerable advances in Slavic (not to mention Balto-Slavic and Indo-European) historical phonology since 1929, for example, the discovery of Old Novgorodian, the explosion of research on Balto-Slavic ac-centology, and major revisions to the reconstruction and chronology of Proto-Slavic, viz. Early Common Slavic and Late Common Slavic. The following paragraphs will attempt to do justice to the impact of *Remarks* while placing it in its historical context, by highlighting both those points in which Jakobson's analysis marked a breakthrough and/or presaged later ideas, and those which have since been superseded or are of purely historical interest.

All historians of linguistics agree that Jakobson and his Prague Circle col-leagues played a crucial role in propagating Saussure's notion of language as a self-contained system (*un système où tout se tient*) and applying it to diachrony. Although the Neogrammarian generation of Slavicists and Indo-Europeanists was not quite as singlemindedly concerned with establishing sound laws as is sometimes caricatured, it is nevertheless true that much scholarship before World War I treated changes such as palatalization or umlaut in atomistic terms, as isolated events. Jakobson argued that all linguistic changes must be viewed in terms of their impact on the structure of the language as a whole, a view that has since come to seem entirely natural.

Remarks also introduced numerous groundbreaking concepts and antici-pated others that would become established in the work of later generations. The remarks on phonemic oppositions in chapter 1 presage distinctive fea-ture theory, although Jakobson's terminology was to change in the following decades as he posited new binary oppositions (see Feldstein's discussion on pp. 10–11). Jakobson's reference to the "speech community" (16) within which variation between older and newer phonological stages can be assigned to different generations or styles (17–18) comes across as strikingly modern, as the notion of the speech community did not become widespread until the

1960s; he also acknowledges variation on the individual level, that "one and the same person can use the existing variants of the language" (18).

At numerous points, Jakobson refers to what is now called diffusion of linguistic innovations in time and space. Much of his discussion is obscured for the present-day reader by the use of such terms as "borrowing" and "copying" (see, e.g., 104–06) or "hybridization" (161); but in all cases he is describing geographical and social diffusion of sound changes in progress. With his description of the relation between central and peripheral Ukrainian varieties (111) and of the Lach dialects as forming a "bridge" between the Czech and Polish consonant systems (117), Jakobson demonstrates his familiarity with many of the concepts of dialect geography that were famously explored by the Italian school of *geolinguistica* before and after World War II. The late spread of *akan'e* to Moscow, while the surrounding villages according to Dal' maintained *okan'e* as late as the mid-19th century (151), is a classic example of what is now known as the cascade model of linguistic diffusion first to larger, then to smaller population centers (see e.g., Labov 2003). The spread of *akan'e* itself is a typical instance of the well-known principle that mergers expand at the expense of distinctions (Herzog's Principle; Labov 1994: 311–31). And given that moving images had only come into being a generation earlier, Jakobson's likening of the advance of isoglosses across the East Slavic territory to a motion picture (125) must have been a particularly timely metaphor.

Jakobson's observation that phonological correlations can encompass genetically unrelated contiguous languages (88, 202 [note 12 to chapter 7]) reveals his interest in linguistic areas, an interest shared with Trubetzkoy, who had just introduced the term *Sprachbund* the year before (Trubetzkoy 1928; cf. Jakobson 1931). Finally, Jakobson prefigures later ideas about linguistic change in terms of change in underlying forms, as when he speaks of rapid speech variants becoming generalized (i.e., to all registers) and causing change "at a deeper level of intuition" (77), or when he describes how the palatalization of consonants word-finally and before certain vowels was "felt to be autonomous" (121), that is, the phonetic palatalization of these consonants was reanalyzed as underlying.

On the other hand, many of Jakobson's views on language change in general and on Slavic historical phonology in particular have not stood the test of time. As Feldstein explains in the Foreword, Jakobson held a teleological view of language evolution (cf. Jakobson 1928), according to which different "incompatible" features were in a "struggle" or "conflict" (xv) in a language, which would have to eliminate one or both unless it had previously "anticipated" the conflict by adopting appropriate changes (xvi). He approvingly cited Saussure's analogy between the workings of language and a game of chess, but criticized Saussure for not extending the analogy to diachrony (xiv, 15–16, 22), that is, for not "abandoning the mechanical nature" of sound laws (19). This teleological view of language change runs throughout *Remarks*, as

for example, when Jakobson states that "the loss of weak *jers* had upset the balance of the phonological system and the urgent necessity of reestablishing order required irrevocable changes" (78), or "the change from a phonemic pitch accent system to an intensity accent system required systemic adjustments" (155). Jakobson contrasts this with the "Neogrammarian rut" (15) in which Saussure persisted, the view that "language does not anticipate anything and … its parts move by accident", so that "the history of the sounds of a given language would be the result of turmoil and blind deterioration, caused by extrinsic factors" (16). For Jakobson, then, "the Neogrammarian concept of language history is tantamount to the absence of a theory" (164).

This is not the place to review the history of functionalist thinking on language, but readers of *Remarks* should be aware that historical linguists today do not in general believe that language change moves toward any particular goal. Already in the 19th century Darwin in his *Descent of man* (1871 I: 59–62) drew attention to the parallels between linguistic and biological evolution, but the general consensus of 20th-century linguistics holds that there is no evidence for natural selection or adaptive evolution in language change (Greenberg 1959: 69, Labov 2001: 6–15). Studies of language change (especially sound change) in progress since the 1960s have established that the only relevant advantage is to be found in the social context of language, whereby certain innovations acquire positive social evaluation and so spread through a speech community, then diffuse to other communities.[1] This is not to say that the structure of a language plays no role in the possible direction of development—it clearly does, which is a reason why one finds examples of "drift", i.e., parallel but independent developments in many language families of the world—only that the exact direction and resulting outcome depend above all on extralinguistic factors, which for the past can almost never be even approximately reconstructed.

With respect to Saussure's chess analogy, Jakobson is correct that prior moves affect the synchronic system, but it hardly follows that language always tends by design toward a state of equilibrium in every, or even any, subsystem. The prevailing view today holds that human languages exhibit all sorts of synchronically unmotivated features that make sense only in terms of their history, much as male nipples or the human tailbone make sense only in the context of evolution (Lass 1997: 12–16). Languages thus abound in skewed distributions of phonological and morphological features ("accidental gaps"), which can persist over generations or even millennia. For instance, English allows the initial clusters *sl-*, *sn-*, *sm-*, but not **sr-*, which became *str-* already in Proto-Germanic; and only clusters of voiceless fricative + sonorant occur in general, including *fr-*, *fl-*, *thr-*, yet native speakers can pronounce

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[1] For an exhaustive treatment of phonological change in its social context, see Labov 2001.

onomatopoeic or foreign words such as *vroom, Vladimir, Zlatan* without diffi-
culty. Within Slavic, both modern standard Russian and Polish have phone-
mic consonant palatalization, but Polish systematically contrasts hard and soft
paired consonants before all vowels, whereas Russian allows only soft con-
sonants before *e*. A teleological approach to language change is furthermore
hard pressed to account for the merger of Classical Greek /i/, /iː/, /eː/, /ei/, /ɛː/,
/y/, /yː/, /oi/, /yi/ as Modern Greek /i/, or the massive homophony that resulted
by the operation of regular sound change from Old to Modern Mandarin Chi-
nese, or the collapse in French of the singular-plural distinction for nearly all
nouns following the loss of word-final -*s*. Such examples of "dysfunctional" or
communication-destroying sound change could easily be multiplied.

It is in this context that the correlations of phonological features observed
in Slavic languages should be understood. As the well-known saying goes,
"correlation does not imply causation", which is why one can uncover all sorts
of bizarre statistical correlations in the real world, for example, between the
divorce rate in the U.S. state of Maine and annual U.S. per capita consump-
tion of margarine.[2] That no modern Slavic language possesses both phone-
mic pitch and consonant palatalization (Jakobson's "conflict A"), or phonemic
intensity accent and vowel quantity ("conflict B"), is an interesting observa-
tion, but does it thereby follow that no Slavic variety could ever possess such
"conflicting" features for any length of time? This line of reasoning not only
runs the risk of *argumentum e silentio*, it also *a priori* excludes other potential
explanations for the observed distribution of facts, for example, the result of
distinct, overlaying isoglosses. *Remarks* contains numerous statements such
as "the Slavic languages that regularly preserved length under circumflex
are the only ones that preserved tonal distinctions" (36); but the proverbial
chicken-and-egg question of **why** these correlations occur and how they come
about is never explicitly broached. Some correlations are supported by cross-
linguistic or articulatory evidence, for example, reduction of unaccented vow-
els is generally associated with a strong intensity accent, but this does not
mean that the latter necessarily "causes" the former, as Jakobson argues in
chapter 9 (143–45 and passim).

This point is important, because Jakobson was consciously attempting,
in Feldstein's words, "to deal with general and universal principles of his-
torical linguistic evolution, rather than the specifics of the Common Slavic
or East Slavic situation" (123). Jakobson's explication of "Laws of reciprocal
relations of correlations" (19–20) illustrates his pioneering interest in linguis-
tic typology and foreshadows the search for phonological universals at the
turn of the 21st century, for example, "if a language has voiced fricatives, it
also has voiced stops." Many of his generalizations, however, are based solely

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[2] For these and other examples, see http://www.tylervigen.com/spurious-correlations
(accessed 25 May 2020).

on Slavic languages and thus are far from universal in scope, as for example, when he asserts that pitch contrasts presuppose phonemic vowel length (20, 23; contradicted by Bantu languages), or that "if phonemic palatalization exists, then phonemic pitch must be absent (stated as a Slavic rule that is not necessarily universal)" (123; contradicted by Japanese, as Jakobson acknowledges in note 2 to chapter 6 [199], as well as Lithuanian and Latvian). In fact, considerations of language universals could be adduced in favor of some of Jakobson's observations, for example, the strong crosslinguistic tendency for consonants to be palatalized earlier by high front vocalics underlies the "two levels of palatalization" before high vs. mid front vowels (47), while the propensity for velars to be fronted next to high vowels accounts for the shift of *ky, gy, xy* > *k'i, g'i, x'i* (100–101, 120), and the reduction of the three-way contrast between nonpalatalized *r, l, n*, palatalized *r', l', n'*, and palatal *rj, lj, nj* (118–19) is connected with the fact that a phonemic opposition of [nʲ] vs. [ɲ] for example is crosslinguistically rare.

I add a few remarks on individual points where Jakobson's analyses are to be modified in the current state of research. With respect to Chapter 3, the reconstruction of Proto-Slavic today is quite different from that of Jakobson's time, so that references to "original long and short *o* in Common Slavic" (51) for example must be adjusted accordingly. Despite Jakobson's valiant efforts, most scholars believe that the split between South Slavic -*y* and North Slavic -*a* in the M nom. sg. of the present active participle does not have a purely phonological explanation (32; see Olander 2015: 88–92), and the similar contrast of South Slavic -*ę* vs. North Slavic -*ě* in the *jo*-stem acc. pl. and *jā*-stem gen. sg., nom. pl., and acc. pl. (the notorious *ě tertium*; 34–35, 52) is also likely to have a morphological origin (see most recently Kim 2019).

It should be kept in mind that many of the processes described in this chapter are properly speaking post-Proto-Slavic or Late Common Slavic, so that we are dealing with innovations that spread across an enormous, steadily diversifying dialect continuum stretching from the Elbe to the Peloponnese to northern Russia. Among these processes were the two famous tendencies toward rising sonority and syllabic synharmony, the latter including the creation of soft and hard consonants (xx–xxi). These were however only tendencies or, in constraint-based phonological approaches, surface conspiracies made up of multiple individual developments, and were never exceptionless rules at any recoverable synchronic stage. In particular, the crosslinguistically trivial palatalization of consonants before front vowels was at most an incipient phonetic process in Proto-Slavic, which is why Jakobson devotes his chapter 7 to "the establishment of the "soft ~ hard consonant" correlation" in certain languages such as Russian, but not others, such as Ukrainian; to my knowledge, there is no basis for assuming that the contrast was phonemicized, then lost in Western South Slavic (41–42, 85). One must therefore reject the fundamental assumption underlying the discussion in chapter 4, that **e

and *o were not phonemically contrastive in Proto-Slavic, that is, "o was the fundamental variant of the e/o archiphoneme" (59), with e automatically occurring after soft consonants; all reconstructions to my knowledge operate with distinct nonhigh vowels *e and *a (> *o) for Proto-Slavic and the earliest stages of the individual Slavic languages.

In chapter 6, the loss of weak jers is connected to other phonological changes that differentiated the emerging Slavic languages, above all phonemic palatalization and the vowel system. Jakobson's choice of Czech, Western Bulgarian, and Northern Kashubian (i.e., the now extinct Slovincian) is interesting inasmuch as these represent transitional or peripheral areas from the perspective of Slavic dialect geography. Much of the discussion in section 6.6 is now outdated—note in particular that the oft-repeated claim that "[g]rammatical analogy is not sufficient in and of itself to cause a phonological correlation either to come into existence or to disappear" (86) does encounter exceptions (Hock 1991: 206–09)—but the importance of Slovincian as a relic of mobile stress in West Slavic cannot be underestimated.

In chapter 7, what Jakobson terms "the role of prothetic v" in the East Slavic languages simply refers to their conditioning: prothesis is regular before u- and o- in Belorusian and Ukrainian, including before $\widehat{uo} > i$ in the latter (cf. Ukrainian vin 'he', vivc'á 'sheep'), but confined to sporadic cases in Russian (e.g., vósem' 'eight', vótčina 'patrimony'). Felstein's annotations (128–31) are especially helpful here, as Jakobson does not in fact mention prothetic v- in his discussion of Ukrainian in section 7.6. The reader misses some reference to West Slavic, where prothesis also occurs: before o- in Upper Sorbian and Lower Sorbian; variably before o- in Colloquial Czech, where it is a well-studied sociolinguistic variable (see Chromý 2017); before reflexes of Late Common Slavic *ǫ- in Polish (e.g., węgiel 'coal', wąski 'narrow'), and before o- as [wo-] in numerous Polish dialects, most famously those of Podhale (e.g., łokno 'window'). Pace Jakobson, we are dealing with a crosslinguistically common phonetic process independent of other developments affecting vowels or consonants, attested outside Slavic in languages from Armenian to Kazakh to Indian English.

Despite these criticisms, Remarks should not be seen as a mere historical monument, of value only to those interested in the historical development of Slavic linguistic studies. An early highlight for this reviewer is the collection of data in chapter 4 relating to the variation of je- ~ o, a perennial problem of Slavic and indeed Balto-Slavic historical linguistics, including often overlooked facts such as Old Russian Vifleomŭ 'Bethlehem', Geona 'Gehenna' (showing that the alternation was not limited to word-initial position) and the Lower Sorbian contrast of je- vs. he-. Chapters 7 and 9 have also aged quite

well. In the former, the overview of East Slavic vowel changes remains useful, particularly the presentation of Ukrainian dialectal developments (northern, southern, Transcarpathian); while for his part, Feldstein provides an extremely lucid commentary on Jakobson's conception of the chronology of weak jer loss in Slavic and its effects in East Slavic in the annotations to chapters 6 and 7, complete with figures depicting the diffusion of jer-fall (94–95) and tables summarizing conflicts A and B and their resolution in East Slavic (126–27). Chapter 9 offers a survey of *akan'e* and *jakan'e*, which Jakobson rightly presents as a reduction of phonemic contrasts in pretonic syllables, conditioned in sometimes complex ways by the vowel of the tonic syllable and/or soft ~ hard quality of the adjacent consonants (dissimilative *akan'e*). Those who are familiar only with the standard Russian rules for unstressed vowels will be impressed by the sheer diversity of patterns attested in traditional East Slavic dialects, many of which have since disappeared under the impact of war, urbanization, and other modern developments.

As already noted, Feldstein's translation is outstandingly precise and idiomatic, and his annotations nicely complement Jakobson's often dense treatment of complex facts. I have detected only a handful of lapses: p. 5, l. 4 from below should say "since literary Russian does not have long hard hushers as single phonological units"; p. 31, l. 2 should be "of the stronger component, to the detriment of the weaker one"; p. 41, section 3.18: Dependency > Dependence; p. 59, l. 4 from below: in front of which > before which; p. 88, l. 13: in the latter > in the former; p. 103, l. 7 from bottom: This tendency was derived from; p. 135, l. 12 from below: change of *o* to *e* > change of *e* to *o*; p. 149, l. 12 from below: in accented syllables > in unaccented syllables; p. 159, l. 6 from below: *contradiction* > *contradictio*; p. 198, l. 9: delete the first *o* in $o\widehat{o_2}r_1dlo$. In Figure C.3 on p. 179, *e* conditions pretonic [i] and *'o*, *o* pretonic [a]; in Figure C.4, *e*, *'o* condition pretonic [i] and *o* pretonic [a]. On p. 184, table C.11 from the preceding page has been mistakenly copied as table C.12. Finally, palatalized labials are found not only "in some dialects" of Polish (94), but also in the standard language under some analyses (e.g., Gussmann 2007: 32–46).

In closing, Prof. Feldstein is to be commended for having produced an elegantly annotated edition of one of Jakobson's seminal early works, which will introduce his theoretical concepts and insights to a new generation of Slavicists. That many of Jakobson's views are no longer widely held does not in any way diminish his stature in Slavic studies, and younger scholars who have not had any exposure to Jakobsonian (or indeed structural) linguistics will benefit greatly from *Remarks*. The problems of Slavic historical linguistics and dialectology discussed there are notoriously refractory, and it is of more than historical interest to recall how they were treated by Jakobson and his

colleagues in the legendary Prague School. If we want to move forward, we need to know where we came from.

References

Chromý, Jan. (2017) *Protetické* v- *v češtině*. Prague: Vydavatelství FF UK.

Darwin, Charles. (1871) *The descent of man and selection in relation to sex*. 2 vols. London: John Murray.

Greenberg, Joseph. (1959) "Language and evolution". Betty J. Meggers, ed. *Evolution and anthropology: A centennial appraisal*. Washington, D.C.: Anthropological Society of Washington, 61–75.

Gussmann, Edmund. (2007) *The phonology of Polish*. Oxford: Oxford University Press.

Hock, Hans Henrich. (1991) *Principles of historical linguistics*. Second revised and updated edition. Berlin and New York: Mouton de Gruyter.

Illič-Svityč, V. M. (1979) *Nominal accentuation in Baltic and Slavic*. Tr. by Richard L. Leed and Ronald F. Feldstein. Cambridge, MA and London: The MIT Press.

Jakobson, Roman. (1923) *O češskom stixe preimuščestvenno v sopostavlenii s russkim*. Berlin: Opoiaz; Moscow: R.S.F.S.R. Gosudarstvennoe Izdatel'stvo. (Reprinted 1969, Providence: Brown University Press.)

———. (1928) "The concept of sound law and the teleological criterion". In *Selected writings*. Vol. 1: *Phonological studies*. The Hague: Mouton, 1–2.

———. (1931) "Über die phonologischen Sprachbünde". *Travaux du Cercle Linguistique de Prague* 4: 234–40. (Reprinted 1962 in *Selected writings*. Vol. 1: *Phonological studies*. The Hague: Mouton, 137–43.)

———. (1962–2014) *Selected writings*. 9 vols. The Hague: Mouton; Berlin: Mouton de Gruyter.

Kim, Ronald I. (2019) "North Slavic -*ě* vs. South Slavic -*ę*: A problem of forward reconstruction." *Journal of Slavic linguistics* 27(1): 1–26.

Labov, William. (1994) *Principles of linguistic change*. Volume 1: *Internal factors*. Oxford and Cambridge, MA: Blackwell. [*Language in society*, 20.]

———. (2001) *Principles of linguistic change*. Volume 2: *Social factors*. Oxford and Cambridge, MA: Blackwell. [*Language in society*, 29.]

———. (2003) "Pursuing the cascade model". David Britain and Jenny Cheshire, eds. *Social dialectology: In honour of Peter Trudgill*. Amsterdam and Philadelphia: John Benjamins, 9–22. [*IMPACT: Studies in language, culture, and society*, 16.]

Lass, Roger (1997) *Historical linguistics and language change*. Cambridge: Cambridge University Press. [*Cambridge studies in linguistics*, 81.]

Olander, Thomas. (2015) *Proto-Slavic inflectional morphology: A comparative handbook*. Leiden and Boston: Brill. [*Brill's studies in Indo-European languages and linguistics*, 14.]

Trubetzkoy, Nikolai S. (1928) "Proposition 16". *Actes du premier Congrès International de Linguistes à La Haye, du 10–15 avril 1928*. Leiden: A. W. Sijthoff, 17–18.

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Anja Šarić. *Nominalizations, double genitives, and possessives: Evidence for the DP-hypothesis in Serbian.* Berlin and Boston: De Gruyter Mouton, 2018. 169 pp. [*Linguistics and Philosophy*, 8.]

Reviewed by Petra Mišmaš

A lot has been written and said about the universality of the DP projection in the last decade, especially if we consider all the work that has been done with South Slavic languages. And yet it seems that there are still phenomena and data that need to be considered in more detail in order to understand the nominal domain better. This book, a revision of Anja Šarić's PhD thesis, makes a valuable contribution to the literature on the NP/DP debate. The author addresses one phenomenon—the double adnominal genitive construction in Serbian—in detail, but also considers other related phenomena. The book's analysis of the central data falls into three parts—double genitives, nominalizations, and possessives. Šarić does not argue for either a DP or an NP analysis, despite addressing the issue several times. In fact, she does not end up claiming that the DP layer is universal (or the opposite), but rather that the DP needs to be assumed in Serbian if we are to account for the data presented in the book. Unfortunately, however, in much of the discussion, DPs are assumed without showing how the analysis would "suffer" if we assumed an NP structure. Still, Šarić presents counterevidence and alternative accounts for many of the claims against the universal DP. However, potential alternative accounts for the central data, such as recent work by Pereltsvaig (2018) who shows that (Russian) double genitives cannot be taken as an argument for or against a DP layer, are insufficiently presented.

The monograph (or, if we use the author's words, dissertation/thesis) consists of 8 chapters, of which chapter 1 is the introduction and chapter 8 the conclusion. In these chapters, the author undertakes the formidable task of presenting the vast background of literature relevant for the NP/DP debate and literature that itself can be described as a part of the debate, as well as presenting novel data. In what follows I give an overview of the monograph, together with my comments.

Chapter 1 is the introduction to the central topic of the book, the double adnominal genitive construction in Serbian. The decision to refer to the language in question as Serbian is addressed in footnote 1. Serbian is used since it is not clear to the author whether the same judgments hold in Bosnian

or Croatian, as she consulted only Serbian speakers who are not speakers of varieties that have definite articles (varieties of Serbian which have a Macedonian influence, see fn. 36 (p. 41) and Stanković 2019 for details). This is worth noting since it has been proposed that languages without articles do not allow transitive nominals with two genitives (the adnominal genitives parameter, Bošković 2008: 116). In fact, it has been stated previously that Serbian, a language without articles, does not have double genitives, and this apparent lack of the double genitive construction has in turn been taken as evidence for Serbian being an NP language (like Polish, Czech, Russian, Latin).[1] However, in the monograph, the author uses data gathered from Serbian speakers to establish that the double adnominal genitive constructions are in fact available in Serbian under certain conditions. I sum up the relevant data below (all examples are taken from the book).

Serbian data reveals an interesting interplay between possessives and double genitives. Šarić shows that while double genitives with two simplex nouns are ungrammatical, (1a), we can find double genitives in instances where the agent argument of the deverbalized (process) noun (also called *nominalization* in the book) is a complex proper name, (1c), or a noun modified by an adjective, (2c), that is, phrases that cannot be turned into possessives. When a possessive is available, the agent cannot be expressed with a genitive, see the contrast in (2) and (3). Similar observations also hold for result nouns like *fotografija* 'photograph', but while the agent of process nouns can also be expressed by *od strane* 'from side', this does not hold for result nouns, (4). Finally, in passives, the agent nominative can only be expressed with *od strane*.

(1) a. $^{??/*}$osvajanje Rima   Hanibala   *simplex proper name*
              conquest Rome$_{GEN}$ Hannibal$_{GEN}$

     b. Hanibalovo   osvajanje Rima   *possessive*
         Hannibal$_{POSS}$ conquest Rome$_{GEN}$

         'Hannibal's conquest of Rome'

     c. osvajanje Rima   Hanibala   Barke   *complex proper name*
         conquest Rome$_{GEN}$ Hannibal$_{GEN}$ Barca$_{GEN}$

         'Hannibal Barca's conquest of Rome'   (Šarić 2018: (5a–c))

(2) a. $^{??/*}$osvajanje Rima   generala   *bare noun phrase*
              conquest Rome$_{GEN}$ general$_{GEN}$ (6b)

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[1] Šarić also provides data that shows that double genitives are also possible in Russian and in Polish (neither of which has definite articles) with result nouns such as the Russian *fotografija* 'photograph', further weakening the adnominal genitives parameter. See also Norris 2018 for Estonian.

(2) b.   generalovo osvajanje Rima   *possessive*
          general$_{POSS}$ conquest Rome$_{GEN}$

          'general's conquest of Rome'   (8a)

    c.   osvajanje Rima   velikog generala   *modified noun phrase*
          conquest Rome$_{GEN}$ great$_{GEN}$ general$_{GEN}$

          'great general's conquest of Rome'   (6a)

    d.   *veliki generalovo osvajanje Rima   *complex possesive*
          great   general$_{POSS}$ conquest Rome$_{GEN}$ (10a)

(3) a. $^{??/}$*osvajanje Rima   njega   *pronoun*
              conquest Rome$_{GEN}$ he$_{GEN}$ (7)

    b.   njegovo osvajanje Rima   *possessive*
          his$_{POSS}$ conquest Rome$_{GEN}$

          'his conquest of Rome'   (8b)

(4) a.   osvajanje Rima   od   strane (velikog) generala/
          conquest Rome$_{GEN}$ from side   great$_{GEN}$ general$_{GEN}$

          Hanibala   Barke
          Hannibal$_{GEN}$ Barca$_{GEN}$

          'the conquest of Rome by the (great) general/Hanibal Barca' (11a)

    b.   *fotografija   Frankfurta   od   strane Marka   Kostića
          photograph   Frankfurt$_{GEN}$ from side   Marko$_{GEN}$ Kostić$_{GEN}$

          [Intended]: 'photograph of Frankfurt by Marko Kostić'   (13c)

A crucial observation based on this data is that the agent argument is typ-
ically expressed as a possessive, but the adnominal genitive can be used to
express the agent if a possessive cannot be formed. That is, neither complex
proper names nor nouns modified by an adjective can be expressed by posses-
sives. Hence the availability of double genitives in these cases.

   Based on the data, several questions emerge with respect to the genitive-
agent argument. What licenses it? What case-marks it and makes it visible for
theta marking? Is this agent in fact a full-fledged argument of the nominal?
Further questions include: How does the agent genitive acquire genitive mor-
phology (i.e., Is D crucial for this?) What is the status of the possessive (Is it
an adjective or is it a D-like element?) How to deal with the strict word order
of arguments in the nominal domain? And finally: What does the Serbian
data tell us about the universality of the DP? These questions are addressed
throughout the book, with the big-picture conclusion being that Serbian, in
fact, can have a DP layer.

Chapter 2 gives an overview of the literature dealing with the DP hypothesis cross-linguistically and specifically related to Serbian. Based on previous findings, in this chapter D is established as having the following properties: (i) it is the locus of definiteness, (ii) it is responsible for reference assignment (i.e., turning a predicate into a syntactic argument by anchoring it to the extra-linguistic entity), and (iii) it serves as a case assigner. The natural question is What happens in languages that do not have definite articles (i.e., in languages that are assumed not to have a DP layer)? In this context, Šarić reviews some of the arguments that have been made in favor of Serbian, a language without definite articles, being a DP-less language and presents counterarguments and alternative analyses for them, for example, Bašić 2004 for LBE.[2] Chapter 2 also gives the background on case theory, but the theoretical background presentation is also extended into Chapter 3, as a summary of meanings and functions of adnominal genitives and an overview of the nouns with which these genitives appear is given in section 3.1. Specifically, Šarić follows Đurić (2009) in separating these nouns into ones that take arguments obligatorily, the so-called (i) argument-taking nouns that include complex event nominals (e.g., *opisovanje* 'describing'), and the ones that take arguments optionally, the so-called (ii) quasi-argument-taking nouns, which include, among others, result nominals (e.g., *opis* 'description').

What is perhaps the most important part of the monograph, the data related to genitives and possessives, is presented in section 3.2. This section is an overview of the questionnaire that was used to gather the data from 25 Serbian speakers (who were not speakers of the definite-article varieties of Serbian). The examples tested had the form, process noun—theme—external argument, with the external argument, crucially, coming in five different variants (all in the genitive): bare count noun, modified count noun, simple proper name, complex proper name, pronoun. Included in the survey were 14 different nominalizations (complex event nominals). The speakers judged the examples on a 1 to 4 scale, where 4 was considered to be unacceptable (*). If the speakers judged a sentence as completely unacceptable (4/*) or almost unac-

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[2] While the majority of arguments are valid, the 'within-category' stacking of adjectives does not hold up. That is, Šarić mentions that possessives (and demonstratives) are treated as adjectives in the contra-DP camp and claims that if this were the case, we should be able to find possessive stacking within a noun phrase, which we do not, (i). However, the lack of possessive stacking (or demonstrative stacking) cannot be taken as evidence that possessives are not adjectives, as we also cannot find adjective stacking if we consider classes of adjectives in the cartographic sense, see for example Scott 2002, i.e., stacking two adjectives for size is ungrammatical despite both being adjectives.

(i)   *moj tvoj   kompjuter   (21c)
       my   your   computer

(ii) *small tall woman

ceptable (i.e., 3/??), they were asked to change the sentence so that it was well formed. Unfortunately, the author only summarizes the results in a descriptive table and does not provide all the relevant results (an exception being the tables 3.2 and 3.3 for examples 'conquest of Rome' and 'discovery of electricity', respectively). Because of this it is not clear what the criteria were for a condition to be described as well or ill formed (was this decided on a condition-compared-to-condition case or was it predetermined). It is also not completely clear whether there was any variation between the nominalizations—there is a claim made that not all examples are discussed as "their acceptability judgments comply with the results from the two discussed examples with respect to what arguments they take" (p. 42), which indicates that not much variation was found, but at the same time, there are indications that there are factors other than the type of the genitive that play a role, such as grammatical number, see footnote 38. Unfortunately, these factors are not discussed in detail. Still, the author does address each of the five different variations of the external argument individually and, based on the data provided, it is clear why only examples with modified count nouns and complex proper names are taken to be grammatical. Furthermore, the author provides information on additional questionnaires that showed that bare nouns can be used as external arguments in double-genitive constructions if these nouns "sound odd in the possessive form" (p. 47). In doing so, the author shows that double genitives are acceptable if the possessive is not available.

Two additional questionnaires are mentioned. In the first one, 11 subjects judged examples with nouns that sound odd when in a possessive form to show that in these cases genitives are preferred. Another questionnaire checked (with 10 speakers of Serbian) what type of constructions can appear as possessives. Unfortunately, it is not clear what the set-up of the questionnaire was, and the results are only given as a general description of the acceptability of each individual possessive. Still, these results can be summarized as follows: acceptable structures comprise possessives from bare singular nouns, pronouns, simple proper names (either first or last name), a combination of a proper name and a kinship term (exceptions being *otac* 'father' and *brat* 'brother'), a combination of a profession and a proper name (but the longer the profession word, the lower the acceptability—this also influences the acceptability of female profession terms which are typically longer; the length of the proper name, however, has no influence). Completely unacceptable structures comprise possessives from bare plurals, modified nouns, and proper names consisting of first and last name (exceptions being examples in which the first name follows the last name and it is the first name that gets the possessive suffix). In the second part of the subsection, the author accounts for the unacceptable possessives, showing that the components of the possessive must essentially act a single unit.

Further important data points follow in chapter 4. However, it is not clear whether the 11 consulted speakers only provided grammaticality judgments or were also consulted about the interpretation of the key examples. That is, in sections 4.1 and 4.2 Šarić gives an overview of Longobardi 1994 and Kovačević 2014, respectively, while in section 4.3 she adds an observation about the interpretation of arguments in the Serbian nominal domain, and then offers an account of the data, following Longobardi (1994), in section 4.4. Specifically, Šarić shows that the external argument (singular or plural) in Serbian receives a generic interpretation (but this interpretation can become definite if the noun is joined by either a demonstrative or a possessive, indicating that demonstratives and possessives are different from other adjectives), while internal arguments receive an existential reading when they are plural bare nouns or plural nouns modified by an adjective (and a definite reading when they consist of a noun and a possessive or a demonstrative). Building on work by Kovačević (2014), who observes parallels between Longobardi's generalizations about the clausal domain in Italian and the distribution of arguments in the Serbian nominal domain, Šarić takes this data and proposes that Serbian behaves just like what Longobardi claims for English. Specifically, internal argument positions are lexically governed and can therefore host Null D—a phonetically empty element positioned in D and restricted to mass and plural nouns, which are, as suggested in Longobardi, the only nouns that have existential interpretation. External arguments, on the other hand, are not lexically governed and therefore cannot have a Null D. In these cases, the N raises to D at LF and the phrase receives a generic interpretation in both English and Serbian. As for both internal and external arguments that receive a definite interpretation with possessives or demonstratives, Šarić suggests that these elements are moved to the DP. Šarić therefore argues that both internal and external arguments in the Serbian nominal domain can be treated as DPs, which serves as a starting point for an account of genitive assignment in Serbian.

In section 5.1 Šarić follows Bošković 2013 (cited as Bošković 2010) and assumes that adnominal case in Serbian is an instance of structural case, as also proposed in Zlatić 1997. This is taken as a starting point in an analysis of case assignment in result and process nominals. In this analysis, Šarić relies on two sources—Rappaport 1998 and Pesetsky 2013—and since the analysis for case assignment to Russian double genitives that appear with result nouns, which was proposed by Rappaport (1998), cannot be straightforwardly extended to both instances of double genitives in Serbian (i.e., with result and process nouns), Šarić opts for the analysis proposed in Pesetsky 2013. Under this approach, case is an affixal realization of different parts of speech—genitive of Ns, nominative of Ds, obliques of Ps, and accusative of Vs. These affixes are either lexically assigned or feature-assigned via feature copying in instances of merger. Crucially, in following Pesetsky (2013), Šarić assumes the

phase theory at this point (though, interestingly, approaches to the nominal domain within the phase theory were not included in chapter 2) and posits that all nouns under consideration are DPs (as Pesetsky assumes for Russian). In this approach, this means that the two adnominal genitives are merged as DPs and as such bear nominative markers but get genitive affixes via feature assignment in essentially two steps. First the theme is merged as a D while the head noun is merged as a genitive. The head feature assigns genitive to the internal argument and the two are sent to Spell-Out as they are a phase. Next, as Šarić concludes for Russian result nominals and consequently Serbian external arguments, the external argument is merged as a nominative DP and has its genitive assigned from the head noun. Another Spell-Out follows and it is only then that the whole phase is merged with a D, which now modifies the affixes on the head noun. This means that Šarić treats the entire phrase as a DP, but she does not say anything about the consequences of such an analysis (for example, under some accounts, such as Bošković 2005, treating such examples as DPs would mean that no LBE of adjectives modifying such phrases would be possible).[3,4] Unfortunately, there is also no synthesis of this proposal with the account given in chapter 4, leaving the reader wondering about the details of the account.

Chapter 6 focuses on possessives. In section 6.1 previous proposals about possessive formation are put forward (such as Zlatić 2000), followed by a discussion of the categorial status of possessives in section 6.2. Specifically, the question is whether Serbian possessives are exponents of D or adjectives. Šarić shows that there are issues with several pieces of evidence that have been taken to be indicators of possessives being adjectives. In challenging the presented evidence, Šarić claims that it is unlikely that possessives are adjectives, but some of her new evidence also falls short. For example, she shows that one cannot stack possessive adjectives in Serbian, but see footnote 1 above. Furthermore, while Šarić shows that possessive pronouns can be coordinated with genitives, she does not show whether this also holds for other possessives, which would strengthen their similarities. More than that, Šarić does show that one cannot coordinate a possessive with an adjective, which would indicate that possessives are in fact not adjectives. However, it is not necessarily the case that any two types of adjectives can be coordinated. For example,

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[3] Note however that she does mention the treatment of LBE proposed in Bašić (2004) in chapter 2.

[4] Treating the entire phrase as a DP phase is also problematic for the so-called Principle of Distinctness (Richards 2010), according to which linearizing two nodes with the same morphosyntactic features within one Spell-Out domain (i.e., phase without its edge) should cause the derivation to crash. Since, following Richards (2010), Serbo-Croatian is subject to the Principle of Distinctness, finding two genitive phrases within one phase is surprising for reasons beyond the NP/DP-debate.

according to my informant, one also cannot coordinate a classifying and descriptive adjective in Serbo-Croatian, (5). This means that the unacceptability of coordinating a possessive with an adjective could simply be a consequence of the type of adjective.

(5)   *ovo su nemačka i   crvena kola
        this are German and red   cars

So, while I am sympathetic to not treating possessives on a par with adjectives, I do not believe that the evidence presented in this chapter is enough to make this claim. However, making the claim that possessives are exponents of D is crucial for the application of Pesetsky's (2013) proposal about possessive formation in Russian to Serbian. Šarić therefore again offers an overview of the proposals about possessives in Russian from Rappaport 1998 and Pesetsky 2013, both of which argue that possessives in Russian are genitive nominals (and not adjectives) and, building on similarities between Serbian and Russian, extends Pesetsky's (2013) treatment of Russian possessives to Serbian.

In chapter 7 Šarić focuses on nominalizations, and Distributed Morphology is assumed as evidence for a functional structure; the structures presented in Bašić 2010 are taken to propose a functional structure of Serbo-Croatian nominalization. Furthermore, in section 7.2 Šarić builds on the groundwork presented in previous chapters to give an account of all the constructions under discussion, i.e., phrases in which the external argument is either a genitive, a possessive, or the *od strane*-phrase. Chapter 8 concludes the monograph.

The monograph, in my opinion, offers an important contribution to both Slavic linguistics and the NP/DP debate, as Šarić convincingly introduces new data into the discussion. In doing so, she indirectly voices an important caution that linguists too often forget—look at the data closely, as conclusions that are made based on an unacceptable phrase or two will typically turn out to be problematic. Still, the data could be further supported (or not) by investigation of other South Slavic varieties without articles (i.e., checking whether the same judgements apply in Croatian and Bosnian), and giving more detailed information on the surveys presented in the book. Nonetheless, Šarić does a great job at navigating through the vast NP/DP literature, creating a clear picture of the framework and background in addition to presenting new material. Unfortunately, the book falls somewhat short in explaining why the chosen theories were adopted and how they relate to each other; therefore it offers a somewhat fragmented view of the central topics. And yet, this does not take away from the value of the book, which I believe lies primarily in the new data, though the theoretical contribution should not be minimized either. Still, even with this monograph, the NP/DP debate is far from over. And yet *Nominalizations, double genitives, and possessives: Evidence for the DP-*

hypothesis in Serbian will open up new lines of research that will help us better understand the nominal domain in Slavic and in general.

References

Bašić, Monika. (2004) *Nominal subextractions and the structure of NPs in Serbian and English*. M.A. thesis, University of Tromsø.

———. (2010) "On the morphological make-up of nominalizations in Serbian". Artemis Alexiadou and Monika Rathert, eds. *The syntax of nominalizations across languages and frameworks*. Berlin/Boston: De Gruyter Mouton, 39–66.

Bošković, Željko. (2005) "On the locality of left branch extraction and the structure of NP". *Studia linguistica* 59(1): 1–45.

———. (2008) "On the clausal and NP structure of Serbo-Croatian". Richard Compton, Magdalena Goledzinowska, and Ulyana Savchenko, eds. *Formal approaches to Slavic linguistics: The Toronto meeting 2006*. Ann Arbor, MI: Michigan Slavic Publications, 42–75.

———. (2013) "Phases beyond clauses". Lilia Schürcks, Anastasia Giannakidou, and Urtzi Etxeberria, eds. *The nominal structure in Slavic and beyond*. Berlin: De Gruyter Mouton, 75–128. [*Studies in generative grammar*, 116.]

Đurić, Radmila. (2009) *Genitiv u engleskom i njegovi ekvivalenti u srpskom jeziku: Generativni pristup*. M.A. thesis, University of Novi Sad.

Kovačević, Predrag. (2014) *A very minimal syntax: On the relationship of DP, scrambling, and case*. M.A. thesis, University of Novi Sad.

Longobardi, Giuseppe. (1994) "Reference and proper names: A theory of N-movement in syntax and logical form". *Linguistic inquiry* 25(4): 609–65.

Norris, Mark. (2018) "Nominal structure in a language without articles: The case of Estonian". *Glossa: A journal of general linguistics* 3(1): 41. Available at: https://doi.org/10.5334/gjgl.384.

Pereltsvaig, Asya. (2018) "Eventive nominalizations in Russian and the DP/NP debate". *Linguistic inquiry* 49(4): 876–85.

Pesetsky, David. (2013) *Russian case morphology and the syntactic categories*. Cambridge, MA: MIT Press.

Rappaport, Gilbert. (1998) "The Slavic noun phrase". Position paper for *Comparative Slavic Morphosyntax*. Available at: https://slaviccenters.duke.edu/sites/slaviccenters.duke.edu/files/media_items_files/10rappaport.original.pdf

Richards, Norvin. (2010) *Uttering trees*. Cambridge, MA: MIT Press.

Scott, Gary-John. (2002) "Stacked adjectival modification and the structure of nominal phrases". Guglielmo Cinque, ed. *The cartography of syntactic structures*. Vol. 1. Oxford: Oxford University Press, 91–120.

Stanković, Branimir. (2019) "DP or NP? The case of Serbian southeastern dialects and Macedonian language". Branimir Stanković and Aleksandra Janić, eds. *SinFonIJA 6 proceedings*. Niš: Faculty of Philosophy, University

of Niš, 83–118. Available at: https://izdanja.filfak.ni.ac.rs/zbornici/2019/down load/1878_4a637f0f1783cc70d10b818a1ebe29f6.

Zlatić, Larisa. (1997) *The structure of the Serbian noun phrase*. PhD dissertation, The University of Texas at Austin.

———. (2000) "The morpho-syntax of Slavic possessives". Arika Okrent and John Boyle, eds. *The proceedings from the panels of the Chicago Linguistic Society's Thirty-Sixth Meeting*. Volume 36-2. Chicago: Chicago Linguistic Society, 179–90.

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