

## ILLUSTRATIONS OF THE IPA

## Belarusian

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Belarusian (ISO 639-3 BEL) is an Eastern Slavic language spoken by roughly seven million people in the Republic of Belarus (Zapruđski 2007, Census of the Republic of Belarus 2009), a land-locked country in Eastern Europe, bordered by Russia to the north and east, Ukraine to the south, Poland to the west and Lithuania and Latvia to the northwest (Figure 1). Within the Belarusian language, the two main dialects are North Eastern and South Western (Avanesau et al. 1963, Lapkoŭskaya 2008, Smolskaya 2011). Two additional regional forms of Belarusian can be distinguished: the Middle Belarusian dialectal group, incorporating some features of North Eastern and South Western dialects together with certain characteristics of its own, and the West-Polesian (or Brest-Pinsk) dialectal group. The latter group is more distinct linguistically from the other Belarusian dialects and is in many respects close to the Ukrainian language (Lapkoŭskaya 2008, Smolskaya 2011). The focus of this illustration



**Figure 1** Map of Belarus. (Adapted from [https://commons.wikimedia.org/wiki/File:Minsk\\_in\\_Belarus.svg](https://commons.wikimedia.org/wiki/File:Minsk_in_Belarus.svg).)

is Standard Belarusian,<sup>1</sup> which is based on Middle Belarusian speech varieties. For details on the phonetic differences across dialects, the reader is referred to Avanesau et al. (1963) and Lapkoŭskaya (2008).

Currently, most speakers of Belarusian also speak Russian, and code-switching between the two is very common – so much so that the resulting spoken language has been given a name: *Trasyanka*, literally ‘a mixture of hay and straw’ (Zaprudski 2007: 111; Hentschel & Zeller 2014). Zaprudski has argued that Belarusian is ‘in the grip of replacive bilingualism’, yielding to Russian in certain spheres, e.g. science, higher education, and legislature (Zaprudski 2007: 98). Similarly, Ioffe (2003) has noted that Belarusian is often no longer used in daily life, even by Belarusians. Hentschel & Kittel (2011), cited in Zeller (2013: 231), conducted a survey on Belarusian bilingualism and found that only 18% of respondents listed Belarusian as their language of primary communication; 42% listed Russian and 50% listed the Belarusian–Russian mixed speech, i.e. *Trasyanka*. In this context, many researchers consider Belarusian (as opposed to *Trasyanka*) to be an endangered language (Rzetelska-Feleszko 1997, Levy 1999, Gutschmidt 2000, Smolicz & Radzik 2004, Zaprudski 2007, Ramza 2010, Zeller 2013).

Standard Belarusian is a codified form of the language that is accepted as the national norm. Similar to RP/BBC English, it is the language spoken by highly educated people and intellectuals who have a good command of the prescribed pronunciation (orthoepic) norms (Hentschel & Zeller 2014). These norms began to be developed right after 1917 with an aim to eliminate any differences between the spoken and written language (Azarka, Vasileŭskaya & Mikhalevich 2010: 27–28); by the end of the 1930s, the norms were fully codified and acted to prescribe Standard Belarusian pronunciation (Chakhoŭski & Chakhoŭskaya 2010: 100–101).

A number of descriptions exist of the Standard Belarusian sound system, based on auditory, acoustic, and articulatory analyses (Biryła 1958; Chekman 1970; Padluzhny & Chekman 1973; Padluzhny<sup>2</sup> 1977, 1981, 1983; Burlyka et al. 1989; Vygonnaya 1991; Krivitskii, Mihnevich & Padluzhny 2008; Chakhoŭski & Chakhoŭskaya 2010). More recent work, focusing on colloquial Belarusian across dialects, includes Ramza (2011a, b, 2012), Zeller (2013), and Hentschel & Zeller (2014). Both Ramza and Zeller have argued that there is a discrepancy between most traditional descriptions of Belarusian, which tend to be somewhat prescriptive, and the linguistic reality of Belarusian (see also Yankoŭski (1976: 10–20) and Padluzhny 2008 on this topic).

The phonetic description below reflects the pronunciation of a single male speaker of Standard Belarusian in his early thirties, fluent in both Belarusian and Russian. He was born and raised in Minsk. His parents spoke Russian and Belarusian at home, and his grandparents, with whom he regularly spent time, lived in rural Belarus and spoke Belarusian. He also studied Standard Belarusian at school. In his daily life as an adult, he speaks mostly Russian, but continues to be exposed to Belarusian (e.g. in his friendships and through TV programming) and considers himself a fluent speaker. At the time of the recording, he had been living in Victoria, British Columbia, Canada, for approximately one year. He has since moved back to Belarus. Recordings were made in the University of Victoria’s Speech Research Laboratory, in a sound-treated booth, using a Sennheiser microphone and captured onto a PC computer using Sound Forge Pro. In addition, illustrative examples of articulation were recorded using a portable GE Logic E ultrasound machine with a convex 8C-RS probe, and processed using Sony Vegas Pro 12, VirtualDub 1.10.4, and Edgetrak (Li, Kambhamettu & Stone 2005).

<sup>1</sup> Also called Literary Belarusian; see Ramza (2011a) for a discussion of terminology relating to the language.

<sup>2</sup> Note: there are two possible spellings of this author’s name: Padluzhny and Podluzhnyŭ. These variants result from different transliterations from Belarusian and Russian into English. For consistency, we use spelling ‘Padluzhny’ throughout the Illustration. In the references, we stick with the transliteration used in each source.

## Consonants

According to Grygor'jeva et al. (2011: 54), the number of phonemes proposed for Belarusian has ranged from 33 to as many as 54. Variation results from how various consonants are analyzed – as separate phonemes vs. allophones, in particular geminate consonants (discussed further below) and relatively low-frequency consonants: /g g<sup>j</sup> x<sup>j</sup> k<sup>j</sup> ɣ<sup>j</sup> w d͡z/. Palatalized /g<sup>j</sup> x<sup>j</sup> k<sup>j</sup> ɣ<sup>j</sup>/ have limited distribution: they are mainly found before /i/ and in a few borrowings (Chekman 1970: 131). They are therefore often treated as allophones of /g x k ɣ/ rather than separate phonemes. Padluzhny (2008) and Ramza (2011a, b) argue that, in general, /g g<sup>j</sup>/ should be considered historical relics that are slowly being replaced with /ɣ ɣ<sup>j</sup>/. In our experience, most Belarusian speakers pronounce /g/, /g<sup>j</sup>/ as [ɸ], [ɸ<sup>j</sup>], respectively, and this is certainly the case for the speaker that we worked with, e.g. *ганак* ‘porch’ (from Polish) is pronounced [ʰvanak] rather than [ʰganak], and *швагер* ‘brother-in-law’ is pronounced [ʰʃvay<sup>j</sup>er] rather than [ʰʃvag<sup>j</sup>er] (see Figure 4c below).<sup>3</sup> The affricate /d͡z/ is found only in a limited set of words, including borrowings and onomatopoeic expressions (Padluzhny & Chekman 1973). Finally, /w/ occurs exclusively after vowels in coda position, e.g. *браў* [braw] ‘he took’, *праўда* [p<sup>r</sup>awda] ‘truth’, *шоўк* [ʃowk] ‘silk’, *поўны* [p<sup>o</sup>wni] ‘full’. Padluzhny (1969) described [w] as an allophone of the phoneme /v/ (see the details in Gardzei 2013); Chakhoŭski & Chakhoŭskaya (2010: 71–72) classify /w/ as a phoneme because it is contrastive, e.g. *молк* [tolk] ‘sense’ vs. *моўк* [towk] ‘he ground’.

The consonant chart below includes all singleton consonants attested in our recordings, including those with relatively limited distribution, with the exception of [g g<sup>j</sup>], which are not part of our speaker’s inventory – see above. IPA conventions are not used by Belarusian linguists, leading to a certain amount of difficulty in interpreting their descriptions of consonantal places of articulation. The symbols and terms used below reflect our own observations, supplemented by our re-analysis of the palatograms presented in Padluzhny & Chekman (1973), based on Harris’ (2006) guidelines for palatogram analysis.

	Bilabial	Labio-dental	Dental/Alveolar	Post-alveolar/Retroflex	Palatal	Velar	Uvular/Pharyngeal
Plosive	p b p <sup>j</sup> b <sup>j</sup>		t d			k k <sup>j</sup>	
Affricate			t͡s d͡z t͡s <sup>j</sup> d͡z <sup>j</sup>	t͡ʃ d͡ʒ			
Nasal	m m <sup>j</sup>		n n <sup>j</sup>				
Trill			r				
Fricative		f v f <sup>j</sup> v <sup>j</sup>	s z s <sup>j</sup> z <sup>j</sup>	ʂ ʐ		x x <sup>j</sup> ɣ <sup>j</sup>	ɣ
Approximant	w				j		
Lateral approximant			l l <sup>j</sup>				

<sup>3</sup> Our observations regarding [ɸ] in particular are supported by Padluzhny (2008: 34) and Padluzhny & Chekman’s (1973: 219) descriptions.

PHONETIC	CYRILLIC	GLOSS	PHONETIC	CYRILLIC	GLOSS
p	пак	‘pile; stack’	r	рот	‘mouth’
p <sup>j</sup>	п <sup>j</sup> іw	‘he drank’	s	сол <sup>j</sup>	‘salt’
b	бак	‘tank; vat’	s <sup>j</sup>	сеў	‘he sat’
b <sup>j</sup>	б <sup>j</sup> іw	‘he hit or struck’	z	зол <sup>j</sup>	‘wet; slush’
m	‘mata	‘mat’	z <sup>j</sup>	зеў	‘pharynx’
m <sup>j</sup>	‘m <sup>j</sup> æta	‘peppermint’	l	лос <sup>j</sup>	‘elk; moose’
w	ш <sup>j</sup> owk	‘silk’	l <sup>j</sup>	л <sup>j</sup> əс	‘destiny, fate’
f	фał	‘halyard’	ʈ̞	ʈ̞as	‘time’
f <sup>j</sup>	ф <sup>j</sup> en	‘hairdryer’	ɖ̞	ɖ̞as	‘jazz’
v	ваł	‘rampart; wave’	ʂ	шax	‘shah’
v <sup>j</sup>	‘v <sup>j</sup> ena	‘vein’	ʐ	жax	‘fear; fright’
t	тур	‘tour’	j	јət	‘iodine’
d	дур	‘foolishness’	k	кот	‘cat’
ʈ̞s	ʈ̞sɪnk	‘zinc’	k <sup>j</sup>	k <sup>j</sup> it	‘whale’
ʈ̞s <sup>j</sup>	ʈ̞s <sup>j</sup> en <sup>j</sup>	‘shadow’	x	xot	‘motion; movement’
ɖ̞	‘ɖ̞ɪnk aʈ̞s <sup>j</sup>	‘strum’	x <sup>j</sup>	x <sup>j</sup> it	‘hit’
ɖ̞ <sup>j</sup>	ɖ̞ <sup>j</sup> en <sup>j</sup>	‘day’	ɣ <sup>j</sup>	ɣ <sup>j</sup> it	‘guide (NOUN)’
n	нос	‘nose’	ʁ	рот	‘Goth’
n <sup>j</sup>	n <sup>j</sup> əс	‘he carried’			

Phonetically, the Belarusian inventory is similar to that of other Slavic languages.<sup>4</sup> In terms of voicing, the contrast among Belarusian stops and affricates is between voiceless unaspirated /p p<sup>j</sup> t ʈ̞ ʈ̞<sup>j</sup> k k<sup>j</sup>/ and prevoiced /b b<sup>j</sup> d ɖ̞ ɖ̞<sup>j</sup>/. In terms of place of articulation, the primary feature of note is palatalization. As in other Slavic languages, Belarusian contrasts palatalized vs. non-palatalized consonants, commonly referred to as ‘soft’ vs. ‘hard’ consonants (see Bondarko 2005 for justification of this terminology). Although the distribution of palatalized and non-palatalized consonants is closely linked to the distribution of vowels (see the ‘Phonotactics’ section below), palatalization is considered contrastive

<sup>4</sup> Hentshel & Zeller (2014) provide a thorough description of phonetic and phonological differences between Belarusian and Russian.

among consonants because both series of consonants can generally occur in all syllabic positions. Crucially, both can occur in word-final (coda) position, where no following vowel exists to dictate presence vs. absence of palatalization, e.g. *лён* [lʲɐn] ‘flax’ – *конь* [konʲ] ‘horse’, *лѐс* [lʲɐs] ‘destiny, fate’ – *лось* [losʲ] ‘elk’, *гол* [ɔl] ‘goal’ – *моль* [molʲ] ‘moth’. Nonetheless, Belarusian does exhibit certain restrictions on the distribution of palatalization. In particular, contrary to Russian, the contrast between palatalized and non-palatalized obstruents is maintained in final coda position FOR CORONALS ONLY (Chekman 1970: 131; Kochetov 2002: 26): /pʲ bʲ mʲ fʲ vʲ/ occur only before vowels and never in word-final position (Chakhoŭski & Chakhoŭskaya 2010: 41; Gardzei 2013). Palatalized velars /xʲ ʃʲ kʲ/ are also restricted in Belarusian, occurring only before vowels, typically before /i/, in some borrowings before /e/, and very seldom before other vowels (Padluzhny 2008: 42).

In terms of phonetic implementation, Chakhoŭski & Chakhoŭskaya (2010: 28) describe Belarusian as being distinctive among Slavic languages in the phonetic salience of the palatalized/non-palatalized contrast. The strong palatalization of /sʲ zʲ/ in particular has been given a name: *шарылявія* (*шпялявія*) in Belarusian, which translates to ‘lisp-ing’. Certainly the contrast between /s/, /z/ and /sʲ/, /zʲ/ is more salient in Belarusian than in Russian, at least for our speaker (see Yanushevskaya & Bunčić’s (2015) Russian IPA illustration). The realization of palatalization varies somewhat across consonants, although our recordings do not allow us to make any strong claims about how systematic this variation is. Examples of the differences between plain and palatalized consonants as produced by our speaker are provided in Figures 2 and 3.<sup>5</sup> Figure 2 contrasts plain /m/ in *мата* [ˈmata] ‘mat’ (a) with palatalized /mʲ/ in *мята* [ˈmʲætə] ‘peppermint’ (b). The plain and palatalized consonants are similar within the nasal itself ([m]), differing primarily in their release (and in the following vowel): [ˈmʲætə] has an audible [j] following [m], lasting approximately 47 ms; its F2 is relatively high (2023 Hz), and lowers to approximately 1480 Hz in the following vowel [æ]. In [ˈmata], F2 is relatively low (1210 Hz) right from the onset of the post-nasal vowel.

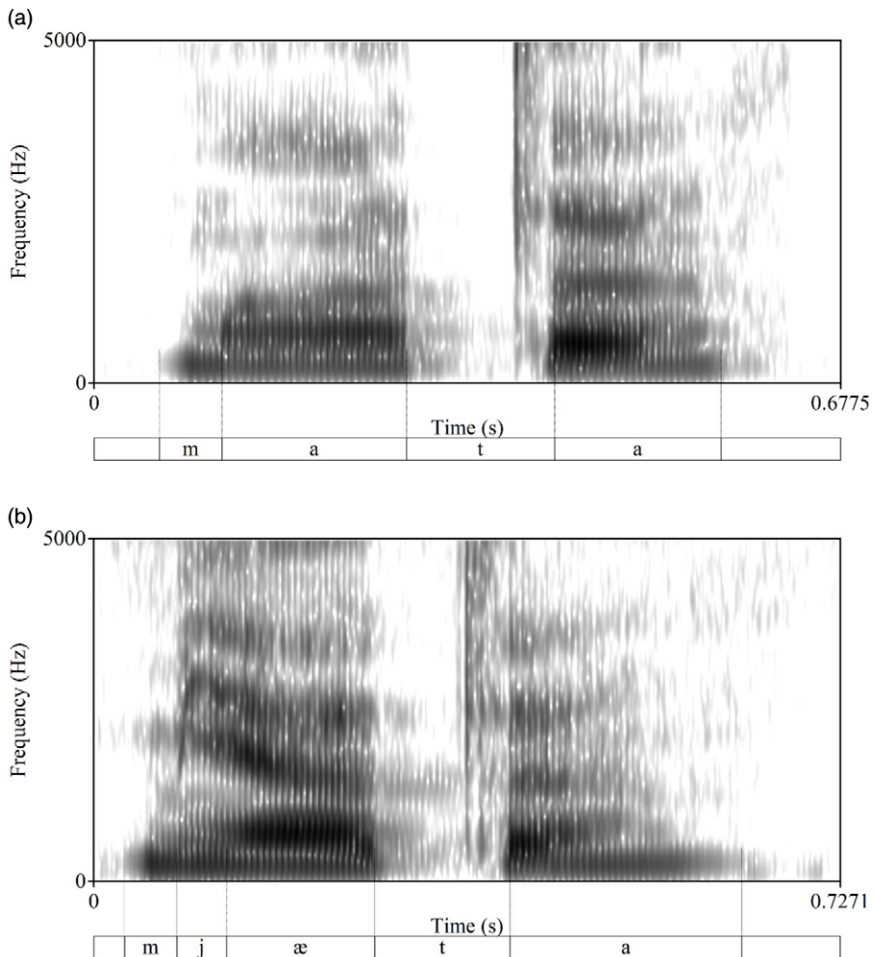
Figure 3 contrasts /n/ from *нос* [nos] ‘nose’ (a) with /nʲ/ from *нёс* [nʲɐs] ‘he carried’ (b). In this case, the plain and palatalized consonants differ within the nasal itself ([n]): /nʲ/ has a relatively high formant (2260 Hz), which is lacking in /n/. This results in a substantial transition in F2 between /nʲ/ and the following vowel, from approximately 2260 Hz down to 1074 Hz (b); no such transition exists for /n/ (a).

Comparing /nʲ/ and /mʲ/, there is a longer, more stable [j] following the nasal in [ˈmʲætə] than in [nʲɐs] (47 ms vs. 22 ms). Padluzhny & Chekman (1973: 251) and Padluzhny (2008: 32) suggest that in Belarusian (in contrast to Russian), the palatalized coronal consonants /sʲ/, /zʲ/, /nʲ/, /dʲzʲ/, /tsʲ/ have a single palatal place of articulation rather than having two places of articulation, dental (primary) and palatal (secondary). Our observations offer preliminary support for their view: whereas /mʲ/ clearly has two sequential places of articulation (labial – palatal), /nʲ/ sounds more like [ɲ], with a single, palatal place of articulation.<sup>6</sup>

For the velar consonants, the plain vs. palatalized counterparts are best illustrated in terms of their articulation directly. Figures 4–6 provide schematic renditions of our speaker’s tongue contours imaged using ultrasound, and then traced using Edgetrack (Li et al. 2005). Note that in these figures, the numbers on the axes do not correspond to particular points along the vocal tract; rather, they are reference points specific to Edgetrack. Figure 4 provides tongue contours of plain and palatalized /k/ ~ /kʲ/ (a), /x/ ~ /xʲ/ (b), and /ʃ/ ~ /ʃʲ/ (c), recorded in a\_a context. In each figure, the palatal glide /j/ is also included as a reference point for the palatal

<sup>5</sup> Unless otherwise noted, visual displays and measurements were made in Praat (Boersma & Weenink 2018).

<sup>6</sup> Note that the different vowel contexts for /mʲ/ and /nʲ/ mean that they are not directly comparable; more focused research is required to confirm any differences in the realization of palatalization across the two sounds.



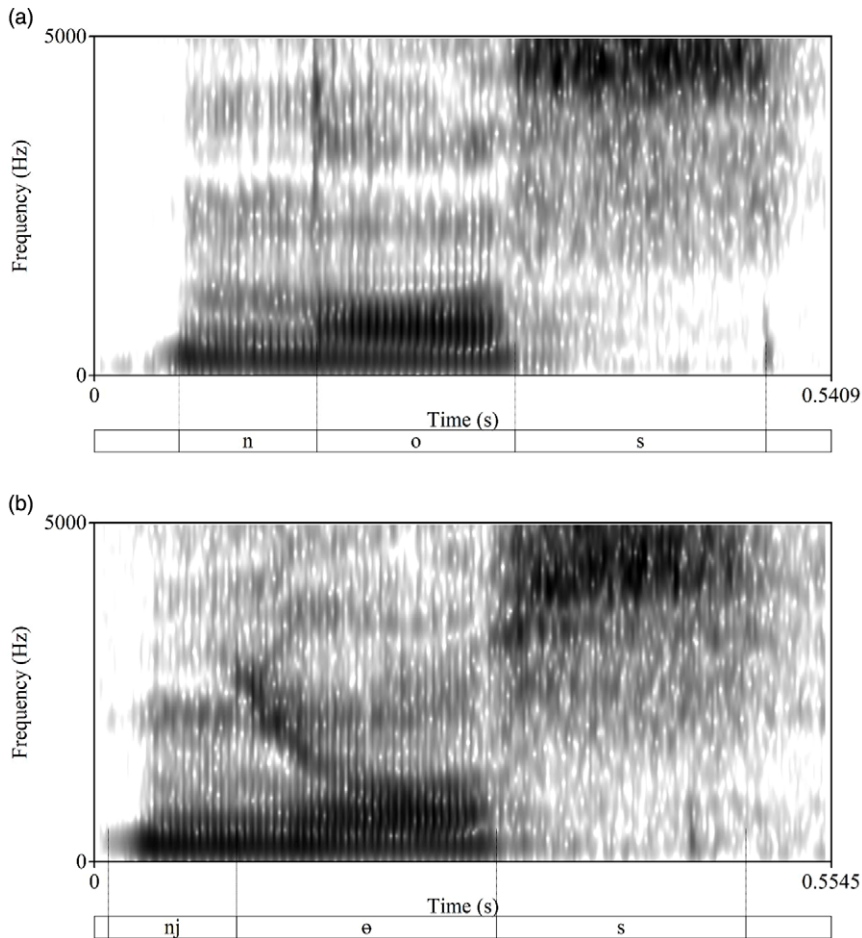
**Figure 2** *мата* [ˈmata] 'mat' (a) vs. *мята* [ˈmʲætə] 'peppermint' (b).

region. These figures demonstrate that the tongue is fronted and raised in palatalized /kʲ xʲ ʧʲ/ compared to /k x ʃ/, corresponding phonetically to [kʲ], [xʲ], [ʧʲ] (Yanushevskaya & Bunčić 2015 describe the same articulation for Russian).

Figure 5 shows that the tongue is substantially lower and more retracted in /ʃ/ than in /x/ and /k/, /ʃ/ being articulated in the uvular or possibly even the pharyngeal region, as noted by Padluzhny (2008: 43) and Padluzhny & Chekman (1973: 219). Note that the palatalized counterpart of /ʃ/, /ʧʲ/, is similar in place of articulation to /kʲ/ and /xʲ/ (Figure 4).

In terms of the non-palatalized consonants, Padluzhny & Chekman (1973) and Padluzhny (2008) have noted that in Belarusian they all have secondary velarization, except for /k x ʃ/, which are inherently velarized (or uvularized in the case of /ʃ/). As an initial investigation of the articulation of non-palatalized consonants in Belarusian, we focused on the post-alveolar fricatives transcribed here as [ʂ ʐ]. These two consonants have been described as 'harder' consonants in Belarusian than in Russian (Padluzhny 2008: 32).<sup>7</sup> Figure 6 provides superimposed

<sup>7</sup> The impression of our speaker as well as that of co-author Litvin (also fluent in Belarusian and Russian) is that [ʂ], [ʐ] involve more lip rounding in Belarusian than they do in Russian, as well as firmer bracing of the tongue against the upper teeth.



**Figure 3** *нос* [nos] 'nose' (a) vs. *нёс* [nʲəs] 'he carried' (b).

tongue contours of [ʂ z<sub>ɫ</sub>] as well as the velar consonant [x], as a reference. We can see that the back of the tongue body for all the three consonants coincides, suggesting strong velarization of Belarusian [ʂ z<sub>ɫ</sub>]. In addition, Figure 6 also shows that the tongue front is raised in [ʂ z<sub>ɫ</sub>], indicating that these sounds are retroflexed, as others have suggested for other Slavic languages (Hamann 2004, Litvin 2014, Yanushevskaya & Bunčić 2015). Further articulatory study is required to confirm the precise articulation of their affricated counterparts /tʃ dʒ/.

In terms of symmetry in the distribution of palatalized and non-palatalized consonants, two points are worth making: first, /r ʂ z<sub>ɫ</sub> tʃ dʒ/ are always non-palatalized in Standard Belarusian, and do not have palatalized counterparts.<sup>8</sup> This contrasts with Russian, which has /rʲ/, and in which /tʃ/ is always palatalized, i.e. phonetically [tʃʲ]. Second, with respect to /tʃ dʒ/, the standard analysis is that they are in fact the palatalized counterparts of /t d/ rather than /ts dz/ (Padluzhny 2008; Grygorʹjeva et al. 2011). This is because [tʃʲ], [dʒʲ] alternate with [t], [d] (but not with [ts], [dz]) in derivational and inflectional morphology (Padluzhny 2008), for example, *xama* [ˈxata] 'house' vs. *y xayɛ* [u ˈxatsʲɛ] 'in the house'; *vaɖa* [vaˈɖa]

<sup>8</sup> Some regional varieties of Belarusian do exhibit /rʲ/ (Avanesaŭ et al. 1963).



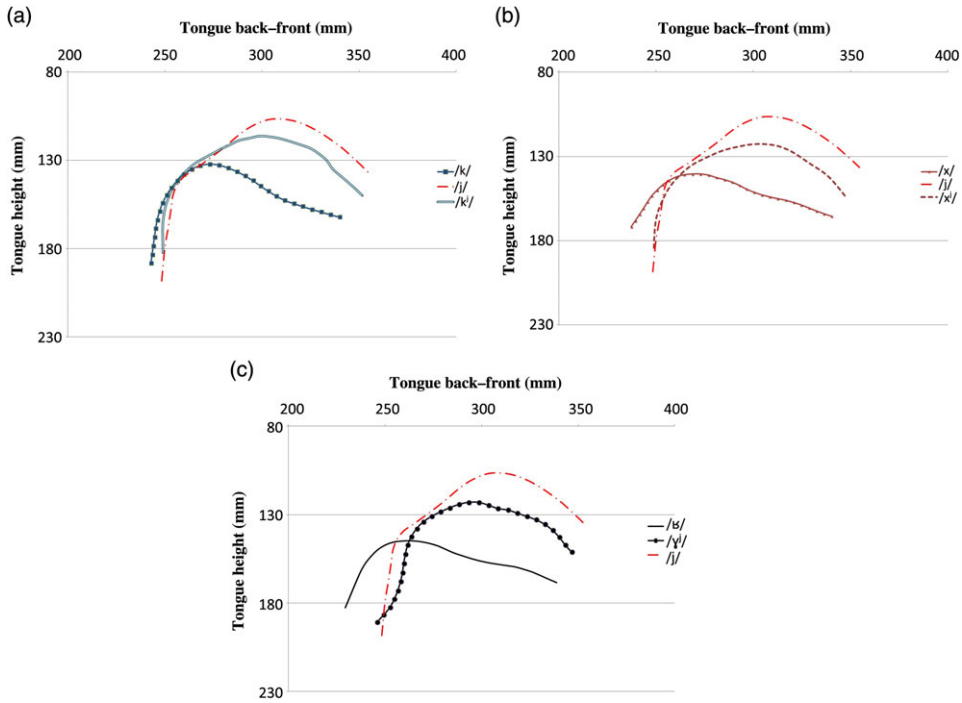


Figure 4 (Colour online) Superimposed tongue contours of /k kʲ j/ (a), /x xʲ j/ (b), and /ʁ ʁʲ j/ (c).

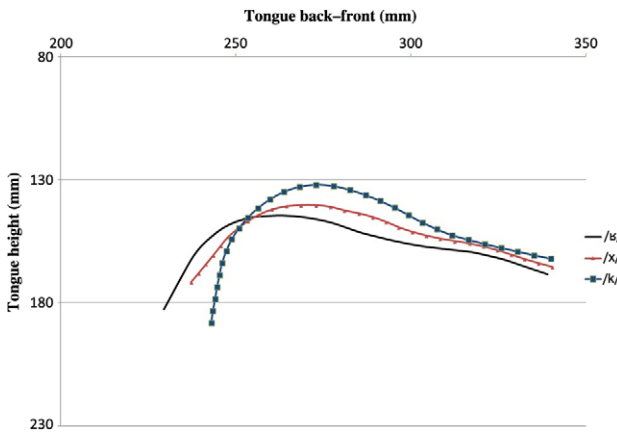


Figure 5 (Colour online) Superimposed tongue contours of /ʁ x k/.

‘water’ vs. *y vadze* [u va<sup>1</sup>dʒe] ‘in the water’.<sup>9</sup> The differences in manner and place of articulation between the non-palatalized /t d/ and their palatalized counterparts [tʲ dʲ] are nonetheless salient enough that the processes by which /t d/ become palatalized/affricated

<sup>9</sup> Further evidence comes from comparing Belarusian and Russian cognates such as ‘wind’: [l<sup>1</sup>vʲe<sup>1</sup>tʲer] (Belarusian) vs. [l<sup>1</sup>vʲe<sup>1</sup>tʲer] (Russian) – see ‘The North Wind and the Sun’ narrative. In fact, Belarusian [tʲ dʲ] are phonetically quite similar to Russian [tʲ dʲ], which Yanushevskaya & Bunčić’s (2015: 223) mention are normally affricated [tʲʃ dʲʃ].



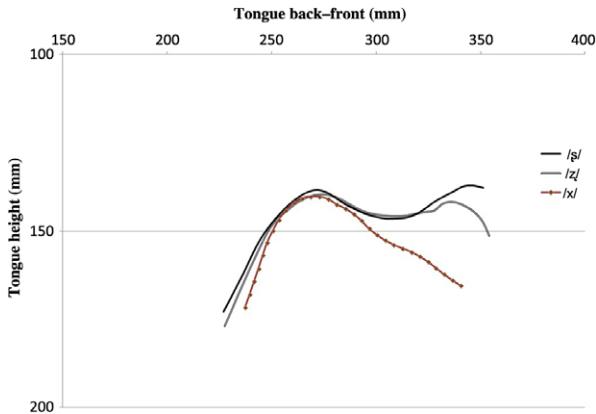


Figure 6 (Colour online) Superimposed tongue contours of /ʂ z, x/.

have been given names in the Belarusian linguistic literature, *dzekanne* and *tsekanne*, and are considered among the most salient sound-related features of Belarusian<sup>10</sup> (Padluzhny 2008).

Finally, in addition to the consonants listed in the inventory above, Belarusian exhibits two types of geminates, both arising from morphological concatenation (Padluzhny 2008: 59): (i) as a result of two identical consonants coming together across a morpheme boundary (e.g. *ссадзіць* [s:a<sup>1</sup>dʒ<sup>1</sup>its<sup>1</sup>] ‘put off’, where [s:] results from concatenation of prefix-final /s/ with stem-initial /s/) and (ii) as a result of lengthening of a morpheme-final consonant between two vowels (e.g. *пытанне* [ph<sup>1</sup>tan<sup>1</sup>:e] ‘question’, where stem-final /n<sup>1</sup>/ geminates between the last vowel in the stem (/a/) and the inflectional suffix /e/). The consonants /p<sup>1</sup> n<sup>1</sup> z<sup>1</sup> s<sup>1</sup> dʒ<sup>1</sup> ts<sup>1</sup> ʂ z<sup>1</sup> tʃ<sup>1</sup>/ can be geminated, representing another salient feature of the Belarusian language (for further details on geminates, see Gachko 2000; Padluzhny 2008: 59; Chakhoŭski & Chakhoŭskaya 2010: 81; Grygor’jeva et al. 2011: 42). Some researchers include geminates in the consonantal inventory, while others claim that because they are composites (at least historically), they are not in the underlying sound inventory of the language (Gardzei 2013). In support of the latter view, Chakhoŭski & Chakhoŭskaya (2010: 81) note that Belarusian does not contrast short and long consonants. In addition, borrowed words lose geminates in Belarusian: compare Belarusian *група* vs. Russian *группа* ‘group’ and Belarusian *маса* vs. Russian *масса* ‘mass’. Finally, some regional varieties of Belarusian do not feature geminates at all, even as composites.

## Vowels

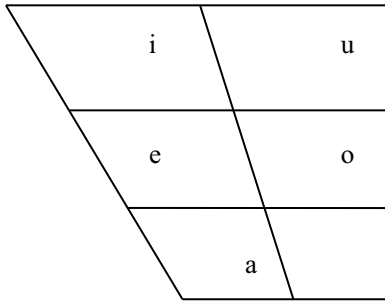
Belarusian has five vowel phonemes (Chakhoŭski & Chakhoŭskaya 2010: 71), broadly /i e a o u/.<sup>11</sup> The phonetic manifestation of these phonemes is determined by two factors: (i) their consonantal environment, which affects the QUALITY of vowels, and (ii) stress, which determines the QUANTITY (duration) as well as QUALITY of vowels. In this section, we consider the consonantal environment; stress is discussed in the ‘Stress’ section immediately below.

Previous research has argued that each (stressed) vowel phoneme has four allophones, based on palatalization of the preceding and following consonants (Chakhoŭski & Chakhoŭskaya 2010: 42; see also Timberlake 2004, on Russian). In general, pre-vocalic consonants have a much greater influence on vowel quality than do post-vocalic consonants;

<sup>10</sup> *Dzekanne* and *tsekanne* do not apply to borrowings: *дэкада* ‘decade’, *дыяспара* ‘diaspora’, *тэатр* ‘theatre’, *тэзіс* ‘thesis’, etc. (Antanyuk & Plotnikau 2006: 36).

<sup>11</sup> Some linguists posit an additional vowel: /i̯/. However, because its distribution is entirely predictable, it is considered here an allophone of /i/.

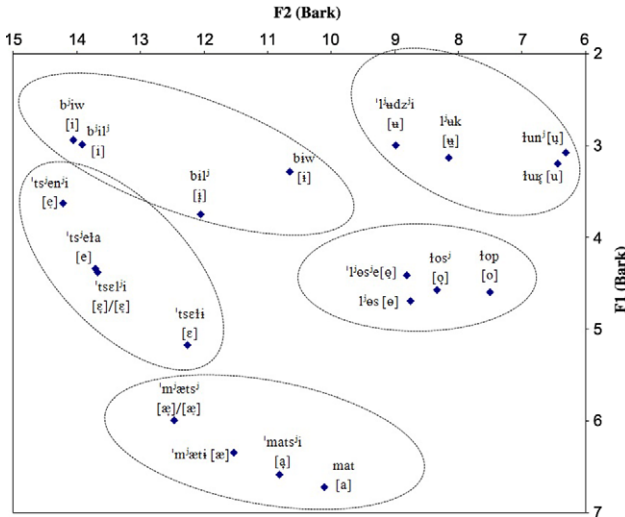
this is reflected in the orthography, in the use of different letters for vowels following but not preceding palatalized consonants. In this illustration, we distinguish only two sets of vowel allophones in our transcriptions: [i e æ ə ʌ] (following palatalized consonants) vs. [i̯ ε a o u] (primarily following non-palatalized consonants). Nonetheless, illustrative words below include vowels in all four environments previously noted to affect vowel quality: C\_C, C\_C<sup>j</sup>, C<sup>j</sup>\_C, and C<sup>j</sup>\_C<sup>j</sup>; these are plotted in Figure 7 below, to show the more subtle variation that exists in the vowel system.



	PHONETIC	CYRILLIC	GLOSS		PHONETIC	CYRILLIC	GLOSS
i	b <sup>h</sup> iw	быў	‘he was’	o	ʃop	лоб	‘forehead’
	b <sup>h</sup> i <sup>j</sup>	быль	‘true story’		ʃos <sup>j</sup>	лось	‘elk’
	b <sup>j</sup> iw	біў	‘he beat (PAST)’		ʃəs	лёс	‘destiny; fate’
	b <sup>j</sup> i <sup>j</sup>	біль	‘bill’		ʃəs <sup>j</sup> e	(y) лёсе	‘(in) the fate (PREPOSITIONAL CASE)’
e	ʃsɛli	цэлы	‘whole; entire; unbroken’	u	ʃuɣ	луг	‘meadow’, <sup>12</sup>
	ʃsɛl <sup>j</sup> i	цэлі	‘goals; aims’		ʃun <sup>j</sup>	лунь	‘lun; harrier’
	ʃs <sup>j</sup> ela	цэла	‘body’		ʃʉk	люк	‘manhole’
	ʃs <sup>j</sup> en <sup>j</sup> i	цені	‘shadows; eye shadow (PL)’		ʃʉdz <sup>j</sup> i	людзі	‘people’
a	mat	мат	‘checkmate’				
	ʃmats <sup>j</sup> i	маці	‘mother’				
	ʃm <sup>j</sup> æti	мяты	‘he crumpled’				
	ʃm <sup>j</sup> æts <sup>j</sup>	мяць	‘crumple’				

<sup>12</sup> Our speaker’s intuition, as well as that of co-author Litvin, is that /ʃ/ is only partially devoiced in word-final position, and that it retains its post-velar place of articulation. Our transcription reflects this intuition, as well as our preliminary acoustic analysis.

The vowel space in Figure 7 is based on our speaker's pronunciation of the words listed above; it plots F1 and F2 (in Hz) at vowel midpoint, converted to the Bark scale using templates provided by Deterding (2006); measurements are averaged over three repetitions of each word in the above word list. Transcriptions are narrower than those provided above, capturing the more subtle variation in vowel quality based on consonantal environment.



**Figure 7** Belarusian vowel allophones (in STRESSED position). Ellipses delineate five vowel phonemes.

Figure 7 shows that vowels following non-palatalized consonants generally have a higher F1 and lower F2 than those following palatalized consonants. Beyond this, vowels differ in how well-defined the previously reported four-way allophonic distribution is: for /a/, there are four fairly distinct allophones; for /o/, there also appear to be four distinct, but closely clustered, allophones; for /i e u/, there seem to be only three surface allophones, although which two allophones are merged is vowel-specific. The vowel /i/ often devoices phrase-finally and when surrounded by voiceless consonants; this is illustrated in the transcription of ‘The North Wind and the Sun’.

## Stress

As mentioned above, stress affects vowel duration as well as quality. In Belarusian, stress is lexically specified and contrastive (e.g. *кара* [ˈkara] ‘punishment; retribution’ vs. *кара* [kaˈra] ‘bark (NOUN)’); it is also used to contrast inflected forms (e.g. *зімы* [zʲiˈmi] ‘winters’ (NOM) vs. *зімы* [zʲiˈmi] ‘winter’ (GEN)). In addition, stress in Belarusian may shift in word-derivation, as in the pair *воз* [vos] ‘cart’ vs. *вазы* [vaˈzi] ‘carts’ (Chakhoŭski & Chakhoŭskaya 2010: 51). The primary acoustic correlates of stress are amplitude, pitch and duration. In terms of duration, a three-way contrast is said to exist between stressed, immediately pre-stressed, and unstressed vowels (Padluzhny 2008: 46; Chakhoŭski & Chakhoŭskaya 2010: 52; see also Timberlake 2004: 43–44, on Russian). The measurements presented in Table 1 are based on vowels in three repetitions each of two multisyllabic words recorded by our speaker: *абаранак* [abaˈranak] ‘bagel’ and *спадабацца* [spadaˈbatsːa] ‘to like’. Immediately post-stress vowels, which should be unstressed, are similar in length to immediately pre-stressed vowels in our recordings; this is likely because, in both words,

the immediately post-stressed vowel is also the final one, and therefore lengthened due to a combination of word-final lengthening and the careful nature of the speech sample.

**Table 1** Average duration (ms) of the vowel /a/ in unstressed, immediately pre-stress, stressed, and immediately post-stress positions, in three tokens each of the Belarusian words *абаранак* [aba<sup>1</sup>ranak] ‘bagel’ and *спадабацца* [spada<sup>1</sup>bats:a] ‘to like’.

Word	Position			
	Unstressed	Immediately pre-stressed	Stressed vowel	Immediately post-stressed
абаранак [aba <sup>1</sup> ranak] ‘bagel’	49	87	150	74
спадабацца [spada <sup>1</sup> bats:a] ‘to like’	46	70	166	94

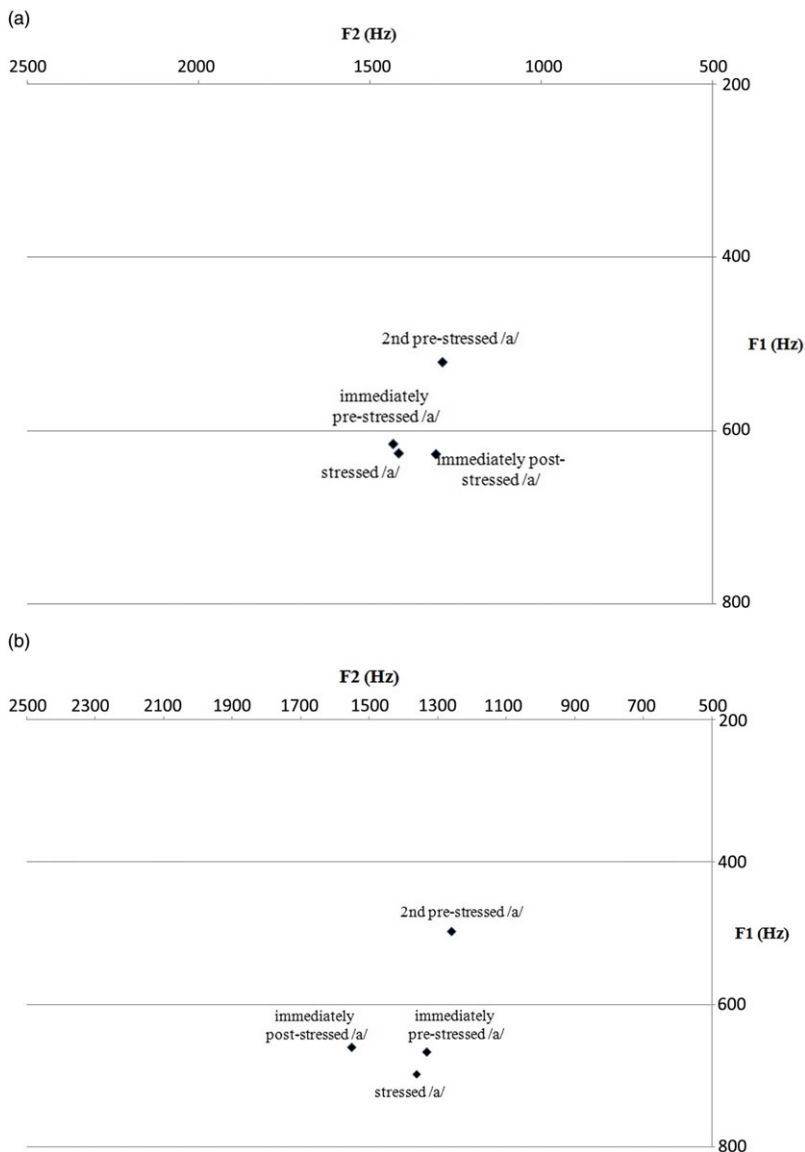
It is generally assumed that unstressed vowels retain their quality<sup>13</sup> in Standard Belarusian (Yankoŭski 1976; Chakhoŭski & Chakhoŭskaya 2010: 39; Grygor’jeva et al. 2011). For example, the words *сырок* [si<sup>1</sup>rok] ‘cheese, curd bar’ vs. *сурок* [su<sup>1</sup>rok] ‘marmot, woodchuck’ are distinguished only by the unstressed vowels in the first syllable of the words (Padluzhny 2008: 46). If vowel quality were lost in unstressed position, we would not expect the unstressed vowels to be distinguishable. However, the same multisyllabic words referred to in Table 1 above show that, at least for our speaker, unstressed vowels do undergo a certain degree of reduction in quality as well as quantity. Figure 8 provides average F1 and F2 values for stressed, immediately pre-stressed, immediately post-stressed, and 2nd pre-stressed (unstressed) /a/, extracted from *абаранак* [aba<sup>1</sup>ranak] ‘bagel’ (Figure 8a) and *спадабацца* [spada<sup>1</sup>bats:a] ‘to like’ (Figure 8b).

Figure 8 suggests that the phonetic quality of /a/ does in fact depend on its position in relation to the stressed vowel: although location of the /a/s on the vowel chart differ by word, immediately pre-stress /a/ is consistently the closest to stressed /a/ and 2nd pre-stressed /a/ is the furthest from it – specifically, it has a much lower F1 than in other positions, indicating a higher vowel (approaching [ʌ]).

Aside from affecting the REALIZATION of vowel quality, stress also affects the DISTRIBUTION of vowel phonemes. Only /i/ and /u/ occur as frequently in unstressed syllables as in stressed ones (Padluzhny 2008: 47); the vowel /o/ only occurs in stressed position. The distribution of other vowels is limited due to two neutralization processes, termed in the Belarusian literature *akanne* and *jakanne*.<sup>14</sup> In *akanne*, the vowels /o/ and /e/ are realized as [a] in unstressed position after a hard consonant, for example in the following word pairs: *воўк* [vowk] ‘wolf’ vs. *ваўкі* [vaw<sup>1</sup>k<sup>1</sup>i] ‘wolves’; *рэчка* [retʃka] ‘river (noun)’ vs. *рачны* [ratʃ<sup>1</sup>ni] ‘riverine (adjective)’. In *jakanne*, the vowels /o/ and /e/ are realized as [æ] after a palatalized consonant in immediately pre-stressed position only (Chakhoŭski & Chakhoŭskaya 2010: 42; Grygor’jeva et al. 2011: 34; Zeller 2013), as in *вёсны* [v<sup>1</sup>esni] ‘Springs’ (PL) vs. *вясна* [v<sup>1</sup>æs<sup>1</sup>na] ‘Spring’ (SG); *белы* [b<sup>1</sup>eli] ‘white’

<sup>13</sup> Zeller (2013) has argued that stress DOES affect vowel quality in Belarusian.

<sup>14</sup> These are considered systematic, categorical (phonological) processes, as opposed to more gradient phonetic changes in vowel quality observed in Figure 7.



**Figure 8** Formant values of /a/ in four syllables of the word *абаранак* [aba'ranak] 'bagel' (a) and *спадабацца* [spada'bats:a] 'to like' (b).

(3D SG MASC) vs. *бяло* [b'jæ'lɔ] 'white' (3D SG NEUT). Neither process occurs in words of foreign origin (Grygor'jeva et al. 2011: 35), for example, *дэкрэт* [de'krɛt] 'decree' (\*[da'krɛt]); *бензін* [b'en'z'in] 'gasoline' (\*[b'jæn'z'in]). While *jakanne* is a distinctive feature of Belarusian, a process similar to *akanne* occurs in Russian as well (Timberlake 2004, Yanushevskaya & Bunčić 2015). Interestingly, the two languages differ in whether or not they represent the process orthographically: in Russian, vowels are written based on their underlying form, e.g. *вода* [va'da] 'water' (SG NOM) is spelled the same as *воды* [vodi] 'water' (NOM PL), despite the fact that /o/ is pronounced differently in the two words. In contrast, in Belarusian, the orthography is more phonetic in nature, e.g. *вода* [va'da] 'water' (SG) vs. *воды* [vodi] 'water' (PL). This reflects the more general fact that

the Belarusian orthography is more phonetically-based than is the Russian orthography. Finally, it should be mentioned that there is variation in whether or not stress-related vowel neutralization processes are realized in pronunciation, even in Standard Belarusian, e.g. *няма* can be pronounced [nʲæ'ma] (with *jakanne*) vs. [nʲi'ma] (without *jakanne*) (Padluzhny 2008: 17).

## Syllables

According to Chakhoŭski & Chakhoŭskaya (2010: 46), approximately 90% of all the words in Belarusian are made of between two and four syllables. The most common syllables are open (CV and CCV), e.g. *ва-да* [va'da] 'water', *за-рад-ска-я* [ʒarad'skaja] 'municipal' (Chakhoŭski & Chakhoŭskaya 2010: 47–48). Onset and coda clusters are allowed however, with certain restrictions. Again according to Chakhoŭski & Chakhoŭskaya (2010: 94), the most infrequent clusters combine two sonorants; the most frequent clusters combine obstruents with other obstruents or resonants, e.g. *слова* ['slova] 'word', *слёзы* ['sʲlʲɔzʲi] 'tears', *горн* [ʒorn] 'clarion', *алімп* [a'lʲimp] 'Olympus'. Clusters like /xv/, /sf/, /ʃl/, /mp/, /mʃ/, /ps/, /ks/ are relatively infrequent, and found primarily in borrowings (Chakhoŭski & Chakhoŭskaya 2010: 93), e.g. *псалом* [psa'lom] 'psalm', *хвоя* ['xvoja] 'fir-needles' (in fact, the recording of the latter word includes a short vocalic element between [x] and [v]).

Belarusian syllables are often slightly different (and simpler) than those in corresponding Russian words. First, word-initial consonant clusters tend to be avoided in Belarusian: in particular, unlike in Russian, unstressed [a] and [i] occur word-initially before combinations of sonorants /r l m w/ with other consonants, e.g. *аўторак* [aw'torak] 'Tuesday' (compare with Russian *вторник* ['ftornik]). Similarly, where Russian has word-final clusters of the type *labial + l* (e.g. /bl/, /ml/, /vl/), in Belarusian such clusters are broken up by a vowel between the labial and the liquid (see details in Yankoŭski 1976: 17), e.g. *рубель* [ru'bʲelʲ] 'ruble' (compare with Russian *рубль* [rublʲ]). Second, words generally do not begin with stressed onsetless syllables. Thus, words that begin with a stressed vowel in Russian, most often include a word-initial consonant in Belarusian cognates, either /v/, /j/, or /ʱ/<sup>15</sup> (Padluzhny 2008: 48), e.g. *возера* ['voz'era] 'lake' (compare to Russian *озеро* ['oz'era]). Similarly, the glide [j] sometimes appears before a stressed /i/ in morpheme- and word-initial position, e.g. *імгла* /im'ʲɫa/ 'haze, fog' can be realized [jim'ʲɫa] (see details in Antanyuk & Plotnikaŭ 2006: 33).

## Phonotactics

As mentioned above, Belarusian is similar to Russian in exhibiting fairly strict co-occurrence restrictions between consonants and following vowels, related to palatalization: palatalized velars /kʲ ʧʲ xʲ/ seldom combine with /a/ and /u/, and combine with /e/ primarily in borrowings, e.g. *зёроў* [ʲɔ'e'roj] 'hero'; palatalized labial consonants also rarely occur with /u/, and again primarily in borrowings, e.g. *чупрэ* [pʲu're] 'puree', *бюро* [bʲu'ro] 'office, bureau'; unlike the palatalized velar consonants, they do occur with /a/; velar /k/, /ʱ/, /x/ seldom combine with /i/. Aside from restrictions related to palatalization, there are few restrictions on how consonants and vowels can combine (Chakhoŭski & Chakhoŭskaya 2010: 90–91).

Belarusian also exhibits a number of phonological processes affecting consonants. Typical of many Slavic languages, Belarusian exhibits word-final devoicing, leading to the (partial) neutralization of word-final voicing contrasts, e.g. *пом* [rot] 'mouth (NOM)' – *рома* ['rota] 'mouth (GEN)' vs. *род* [rodʲ]<sup>16</sup> 'family; kin; clan (nominative)' – *роду* ['rodu]

<sup>15</sup> Before labialized vowels, the consonant is always [v].

<sup>16</sup> In our recording, /d/ devoicing is fairly minimal, possibly due to controlled, clear speech. To reflect the fact that the devoiced stop is not completely merged with its underlyingly voiceless counterpart, we use [d] rather than [t] in our transcription.

'family; kin; clan (GEN)'. Also typical of Slavic languages, Belarusian exhibits regressive assimilatory processes affecting voicing and palatalization. In terms of voicing, obstruents assimilate in voicing to a following obstruent, e.g. *перад полем* [p'ɛrat 'pɔl'em] 'in front of the field' vs. *перад домам* [p'ɛrad 'domam] 'in front of the house'<sup>17</sup> (see also Timberlake 2004, on Russian). In terms of palatalization, the patterns are more complex, and require further study. For our speaker, assimilation seems to occur more consistently within morphemes than across morpheme boundaries, e.g. *дзве* [dʒ'vʲe] 'two, fem' vs. *адвеку* [ad 'vʲeku] 'from ancient'.

## Transcription: 'The North Wind and the Sun'

### Phonemic transcription

paw'notʃni 'vʲets'er i 'sontsa spratʃal'is'a na'kont ta'ko xto z ix biw mats'n'eisʲi, ka'l'i ja'ni napat'ka'l'i van'drown'ika za'kornutaʒa u 'ts'opti ptaʃtʃ. ja'ni paʒa'dʒ'il'is'a ʃto toj z ix xto p'ɛrʃi pri'mus'its' van'drown'ika 'z'n'ats' 'svoj ptaʃtʃ i 'budʒ'e l'i'tʃits'a mats'n'eisʲim. ta'di paw'nofni 'vʲets'er padʒ'muw z us'a'je sva'je 'motsi, a'l'e 'tʃim mats'n'ej jon 'dʒ'muw tim 'ʃtʃil'n'ej van'drown'ik za'xutivaws'a u 'ptaʃtʃ. na'reʃts'e paw'notʃni 'vʲets'er pa'k'inuw sva'je 'sprobi. ta'di 'sontsa 'koratʃa za'z'la'a i van'drown'ik im'k'n'en:a zn'aw ptaʃtʃ. tak paw'notʃni 'vʲets'er biu 'vimuʒani pri'znats' ʃto 'sontsa bi'to mats'n'ejsʲim z ?ix a'bodvux.

### Phonetic transcription

paw'notʃni 'vʲets'er i 'sontsa spratʃal'is'æ na'kont' ta'ko xto z ix biw mats'n'eisʲ(ɨ), ka'l'i ja'ni napat'ka'l'i van'drown'ika za'kornutaʒa u 'ts'opti ptaʃtʃ. ja'ni paʒa'dʒ'il'is'æ ʃto toj z ix xto p'ɛrʃi pri'mus'its' van'drown'ika 'z'n'æts' 'svoj ptaʃtʃ i 'budʒ'e l'i'tʃits'a mats'n'eisʲ(ɨm). ta'di paw'nofni 'vʲets'er padʒ'muw z us'æ'je sva'je 'motsʲi, a'l'e 'tʃim mats'n'ej jon 'dʒ'muw tim 'ʃtʃil'n'ej van'drown'ik za'xutivaws'æ u 'ptaʃtʃ. na'reʃts'e paw'notʃni 'vʲets'er pa'k'inuw sva'je 'sprobi. ta'di 'sontsa 'koratʃa za'z':æ'a i van'drown'ik im'k'n'en:a zn'æw ptaʃtʃ. tak paw'notʃni 'vʲets'er biw 'vimuʒani pri'znats' ʃto 'sontsa bi'lo mats'n'ejsʲim z ?ix a'bodvux.

### Orthographic transcription

Паўночны Вецер і Сонца спрачаліся наконт таго, хто з іх быў мацнейшы, калі яны напаткалі вандроўніка, загорнутага ў цёплы плашч. Яны пагадзіліся, што той з іх, хто першы прымусіць вандроўніка зняць свой плашч, і будзе лічыцца мацнейшым. Тады Паўночны Вецер падзьмуў з усяе свае моцы, але чым мацней ён дзьмуў, тым шчыльней вандроўнік захутваўся ў плашч. Нарэшце Паўночны вецер пакінуў свае спробы. Тады Сонца гарача зазьяла і вандроўнік імгненна зняў плашч. Так Паўночны Вецер быў вымушаны прызнаць, што Сонца было мацнейшым з іх абодвух.

<sup>17</sup> Note that /v/ and /vʲ/ are never devoiced in Belarusian because they surface as [w] at the end of a words and before consonants.



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## Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1017/S0025100319000288>.

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