A Listener-Oriented Account of the Evolution of Diphthongs and Changes in the Jers in Kashubian*

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Abstract: This paper applies the listener-oriented approach (Andersen 1973, 1978; Ohala 1981, 1992) to two diachronic changes in Kashubian: diphthongization and the contextual preservation and loss of the jers. It is shown that acoustic and perceptual factors provide a plausible explanation for the consecutive stages in the evolution of the two phenomena. The Kashubian changes illustrate two major types of the listener-oriented mechanism: changes resulting from hypocorrection and hypercorrection. It is shown that while both mechanisms rely on a phonological reanalysis of ambiguous phonetic properties, the outcome differs in each case: (i) a coarticulatory property is reanalyzed as phonological and (ii) a phonetic element is associated with a phonological source that is distinct from the source assumed by the speaker. While this discussion provides support for the non-deterministic nature of sound change, conditions that promote one type of change while inhibiting the other are identified. In hypocorrective changes, the prior existence of a certain structure in the language facilitates the emergence of this structure in other contexts. Hypercorrective changes, on the other hand, are predicted to occur when a feature with a long acoustic span is involved. Similar processes in other, mostly Slavic, languages are identified and compared with the Kashubian changes, with the aim of filling some gaps in the typology and providing a uniform explanation for these and similar mechanisms of change.

1. Introduction

The listener-oriented approach to change (Andersen 1973, 1978; Ohala 1981) has been successfully used to explain not only diachronic developments, but also recurrent synchronic patterns in unrelated languages. Blevins (2004) argues that the categorical and statistical asymmetries identifiable in linguistic typology find a plausible explanation in common trajectories of sound

* I am grateful to two anonymous reviewers and Christina Bethin, Associate Editor of JSL, for criticisms and other help in preparing this paper. I would also like to thank my Kashubian consultants, Lucyna Łagòda, Dark Majkòwsczi, and Jiwòna Makùrôt, for their help with verifying the data. Finally, I thank the organizers, particularly Łukasz Grzędzicki, and participants of The 6th Summer School of the Kashubian Language in Wieżyca for an inspiring experience.

change. Blevins adds that a better understanding of the mechanisms of a listener-oriented change can shed light on the apparent role of markedness. In fact, typological asymmetries may well reflect statistical distributions of patterns directly derivable from common sound changes, rather than markedness principles.

This paper aims to verify the predictions of the listener-oriented approach to change by analyzing two diachronic changes in Kashubian, an endangered language spoken in northern Poland. The Kashubian changes, diphthongization and the loss and preservation of the jers, have not been given a uniform analysis to date and thus the proposed account fills the gap in the typology of listener-oriented mechanisms. In order to get more insight into the perceptual conditioning of the changes, the relevant pathways of evolution are compared with the developments of similar sounds and sound sequences in closely related languages, such as Polish, Russian, Ukrainian, and Upper and Lower Sorbian. Thus the second goal is to situate the Kashubian sound changes in the typology of similar listener-oriented changes described in the literature and to contribute to the discussion of their conditioning factors. Two types of a listener-oriented change are illustrated and analyzed: changes resulting from hypo- and hypercorrection. Both mechanisms in essence rely on a phonological reanalysis of ambiguous phonetic properties. What differs is the result of the reanalysis. It is shown that the two mechanisms may apply consecutively throughout the evolution of a sound pattern, as they often represent two sides of the same coin. Yet the evidence presented in this paper suggests that there are conditions that render one type of change more likely than the other. Hypocorrective changes are facilitated when the emergent structure is already present in the language. Hypercorrective changes, on the other hand, tend to arise when features with a long acoustic span are involved.

This paper is structured as follows. Section 2 defines and illustrates the listener-oriented approach to sound change. Section 3 offers some background information on Kashubian followed by the description of two context-dependent diachronic sound changes in this language. The loss and preservation of jers and diphthongization in Kashubian are afforded a listener-oriented account. Section 4 provides an overview of parallel sound changes in other languages and discusses the similarities and differences in their conditioning. Section 5 focuses on the distinction between hypo- and hypercorrective changes and applies it to the changes under discussion. Section 6 considers an alternative analysis. Section 7 provides the main conclusions. Below I resort to IPA transcription when the phenomenon under discussion is not reflected in native orthography; otherwise native orthography or transliteration is used.

2. Listener-Oriented Change

A listener-oriented change (Andersen 1973, 1978; Ohala 1981; Blevins 2004; Czaplicki 2010, 2013) has its roots in ambiguities in the phonetic signal that arise from coarticulation. Speech is coarticulated and a phonological analysis carried out by the listener must accommodate this fact. Ohala (1989) discusses two mechanisms subsumed under the listener-oriented change, hypocorrection and hypercorrection. During language acquisition coarticulated features are most commonly factored out from the phonological representation by the listener based on their previous experience with the language.

In hypocorrection, the listener fails to factor out coarticulatory effects and chooses a phonological analysis of the ambiguous speech signal that is distinct from that of the speaker. As a result, a sound change occurs. Ohala (1992) uses the example of the emergence of nasal vowels due to the loss of a nasal consonant in Hindi to illustrate the mechanism of a listener-oriented change through hypocorrection. Vowels before nasals are contextually nasalized [ṽN]. The listener exposed to such a sequence is likely to attribute nasalization to the following nasal consonant and phonologize the sequence without the contextual nasalization of the vowel, that is, as /vN/. However, when the final nasal consonant is lost (for example, due to the reduction in the magnitude of the lingual gesture) the nasalization can no longer be analyzed as contextual and must be attributed to the vowel, giving rise to a distinctively nasal vowel, /ṽ/, in the representation of the listener. A listener-oriented change through hypocorrection is commonly set in motion by the loss of the conditioning environment, which leads to a reanalysis of the acoustic signal. When the phonological representations of the listener and the speaker diverge, a sound change has occurred.

Hypercorrection involves features with a long acoustic span, such as rounding, palatalization, and laryngealization. In language acquisition, the listener is faced with the task of associating a phonological property with its source(s). When a phonological property has long acoustic cues, that is, when it spans over several segments, determining its phonological source is far from straightforward. When the listener designates a different segment as the source of the phonological property than does the speaker, a sound change has resulted. Ohala (1989) argues that hypercorrection is responsible for many dissimilatory changes.

A change that has been convincingly claimed to result from hypercorrection is compensatory lengthening (CL). Well-documented cases of CL through vowel loss can be found in the development of Slavic languages. In Late Common Slavic (LCS), ultra-short high vowels /ɪ/ and /ʊ/ (jers) were lost. This loss caused the preceding vowel to lengthen in many dialects. Reflexes of LCS CL have been identified in a number of Slavic languages, including Serbo-Croatian, Slovak, Czech, Polish, Kashubian, Upper Sorbian, Slovenian,

and Ukrainian (Timberlake 1983a, 1983b, 1988). The words transcribed in (1) illustrate Serbo-Croatian CL (Timberlake 1983a: 222; Kavitskaya 2001: 113).

(1)	Old Church Slavic		Serbo-Croatian	gloss
	borʊ	>	bo:r	'forest'
	rogʊ	>	ro:g	'horn'
	medʊ	>	me:d	'honey'
	vozʊ	>	vo:z	'carriage'
	ledʊ	>	le:d	'ice'
	nosʊ	>	no:s	'nose'
	bokʊ	>	bo:k	'side'

Kavitskaya (2001: 115–17) employs the mechanism of hypocorrection to explain CL due to vowel loss: CVCV → CV:C. She makes use of the well-established acoustic evidence suggesting that vowels in open syllables tend to be longer than vowels in closed syllables (Maddieson 1985; Rietveld and Frauenfelder 1987). In the sequence CV_1CV_2 the longer duration of V_1 can be attributed to its syllable affiliation (open syllable) and factored out. As a result, the vowel is phonologized as short: /CVCV/. However, when the conditioning environment is lost, that is, when the final vowel is not recoverable from the signal, the extra length of V_1 in the newly closed syllable cannot be explained by the context and may be phonologized on V_1, giving rise to a phonologically long vowel: /CV:C/. Thus, phonetic, context-dependent length becomes phonological and distinctive.

It is interesting that the necessary conditions for CL varied from language to language and included the quality of the intervening consonant, accent, jer position (internal vs. final), and the quality of the target and trigger vowels. Timberlake (1983a, 1983b, 1988) provides a detailed discussion of the conditioning and geographical distribution of CL in Slavic. For example, in Upper Sorbian, the quality of the intervening consonant did not play a role, as can be seen in (2), where the [ɔ] ~ [o] alternation corresponds to an earlier length distinction. Reflexes of CL are found in the nom.sg., where the final jer was lost, thus creating the conditions for CL. In the gen.sg., on the other hand, CL did not apply, as the final vowel was retained (Kavitskaya 2001: 129).

(2)	Upper Sorbian		Pre-Upper Sorbian	gloss
	gen.sg.	nom.sg.	nom.sg.	
	wɔz-a	woz	*vȍzʊ	'carriage'
	nɔs-a	nos	*nȍsʊ	'nose'
	rɔd-a	rod	*rȍdʊ	'kin'
	plɔt-a	plot	*plotȍ	'raft'
	dwɔr-a	dwor	*dvorȍ	'yard'
	kɔnj-a	konj	*konjì	'horse'

In Old Polish, CL was conditioned by the quality of the following consonant. CL occurred before sonorants and voiced obstruents, as shown in (3a). A voiceless obstruent failed to trigger CL under the same prosodic conditions, as exemplified in (3b) (Kavitskaya 2001: 135).

(3)	Old Polish			gloss
a.	*domʊ	>	do:m	'house'
	*dõbʊ	>	dã:b	'oak'
	*vozʊ	>	vo:z	'cart'
	*solɪ	>	so:l	'salt'
	*krojɪ	>	kro:j	'style'
	*vodjɪ	>	vo:dz'	'leader'
b.	*sokʊ	>	sok	'juice'
	*bokʊ	>	bok	'side'
	*nosʊ	>	nos	'nose'
	*kostɪ	>	kos't'	'bone'

Kavitskaya (2001: 136), building on Timberlake (1983a, 1983b, 1988), argues that the factor conditioning CL in Old Polish was phonetic length. There is ample evidence that the context of a voiced consonant renders the preceding vowel longer (Kluender, Diehl, and Wright 1988). Therefore, the vowel V_1 in $C_1V_1C_2V_2$ sequences is predicted to be longer when the following consonant, C_2, is voiced than when C_2 is voiceless. In addition, V_1 is subject to open-syllable lengthening, but this process applies regardless of the voicing of C_2 and does not differentiate the two contexts. In line with the mechanism of a listener-oriented change, when the extra length is attributable to an open syllable and the following voiced consonant, it is discounted by the listener. However, when the conditioning context for open syllable lengthening, V_2, is lost, the listener reinterprets the phonetic length as phonological and V_1 becomes distinctively long. This mechanism relies on the finding that vowels before voiced consonants are longer than vowels before voiceless consonants, all else being equal (i.e., when the prosodic conditions are the same). Therefore vowels before voiced consonants are more likely to undergo CL than vowels before voiceless consonants, as confirmed by the conditioning of CL in Old Polish.

In Modern Standard Polish, the reflexes of the Old Polish */o/ and the outcome of CL */o/ are [ɔ] and [u], respectively.[2] In modern orthography <o> spells [ɔ] and <ó> spells [u], as illustrated in (4).

[2] Modern Standard Polish does not show reflexes of CL before nasals. The neutralization of length distinctions before nasals is a process that applied after CL and independently of it. Regional dialects of Polish retain this historical distinction *dóm* 'house'—*dom-u* gen.sg., *kóń* 'horse'—*koni-a* gen.sg. (Timberlake 1983a: 215).

(4)	kroj-u	gen.sg.	krój		‘style’
	sol-i	gen.sg.	sól		‘salt’
	wod-a		wód	gen.pl.	‘water’
	wodz-a	gen.sg.	wódz		‘leader’
	koz-a		kóz	gen.pl.	‘goat’

The quality of the intervening consonant is not the only factor that conditioned CL in Polish. Apart from the expected reflexes of CL before sonorants and voiced obstruents, a handful of words show reflexes of CL before voiceless obstruents, as illustrated in (5) (Timberlake 1983a: 216).

(5)	cnot-a	cnót	gen.pl.	‘virtue’
	stop-a	stóp	gen.pl.	‘foot’
	siostr-a	sióstr	gen.pl.	‘sister’
	robot-a	robót	gen.pl.	‘job’
	sierot-a	sierot ~ sierót	gen.pl.	‘orphan’
	os-a	os ~ ós	gen.pl.	‘wasp’

Timberlake (1983a) argues that CL before voiceless obstruents had prosodic conditioning. Common Slavic (CS) had four distinct accentual patterns: acute and circumflex, either long or short (Timberlake 1983a: 208–9). Prior to the fall of the jers in LCS another pattern of accentuation emerged, the neo-acute pattern. The neo-acute accent arose through the retraction of the accent from originally stressed jers (Timberlake 1983a: 209), and it played a key role in conditioning CL. Timberlake (1983a) presents evidence that words which today show reflexes of CL before voiceless obstruents had the neo-acute accent. He takes it as evidence that vowels under the neo-acute accent were subject to CL irrespective of the quality of the intervening consonant, while vowels under the remaining accents (old acute and circumflex) were subject to CL only when followed by sonorants or voiced obstruents.

Kavitskaya (2001: 158–61) provides a listener-oriented explanation for the different impact of accentuation patterns on CL. She argues that vowels under the neo-acute accent were phonetically longer than comparable vowels under either the old acute or circumflex accents (due to neo-acute lengthening, see Carlton 1991: 198). As a result of this difference, when the final jers were lost, the phonetically longer vowels under the neo-acute accent were more likely to undergo CL than vowels under either the old acute or circumflex accents. In contrast, the voicing of the intervening consonant played a role in conditioning CL when the vowels appeared under the old acute or circumflex accents, that is, when they were phonetically shorter. Thus, phonetic vowel length, which is arguably affected by both the quality of the intervening consonant and the accentuation pattern, is an important factor in explaining the mechanism of CL in Polish. The basic insight of Kavitskaya’s (2001) analysis is that

the phonetic length of a vowel determined its interpretability as distinctively long through CL.

In the next section, we consider two changes in Kashubian that are amenable to an analysis invoking the mechanism of a listener-oriented change, either through hypocorrection or hypercorrection. We return to this distinction in section 5.

3. Kashubian: Background

Kashubian, together with Polish and Polabian (the latter extinct), are Northwest Slavic or Lechitic languages. This endangered language is spoken today mainly in the northwest of Poland (eastern Pomerania). According to data from the 2011 national census, the number of people in Poland who declare Kashubian as their language is just over 108,000 (Główny Urząd Statystyczny 2013).

The vowel system of Central Kashubian is provisionally represented in (6) based on Jocz 2013. Descriptive sources concur that there is considerable dialectal, interspeaker and intraspeaker variation in the realization of vowels (e.g., Breza and Treder 1981: 33ff.; Topolińska 1982; Jocz 2013: 187–88).

(6) The vowel system of Kashubian

i	ɨ	ʉ	u
ɛ	ɵ/ɨ	ə	ɔ
		a	

The vowel represented as /ɵ/ɨ/ in (6), spelled <ô>, is pronounced in Central Kashubian mainly as [ɨ]. The vowel represented by /ə/ is spelled <ë> and is pronounced as [ə], [ʌ], or [ɛ]. The vowels /ʉ/, spelled <u>, and /ɔ/, spelled <o>, and their contextual variants, /wɨ/, spelled <ù>, and /wɛ/, spelled <ò>, will be discussed in section 3.2. In the next section, we focus on the changes that occurred around the time of the loss of historical jers in Kashubian.

3.1. Changes in the Jers

In LCS the jers, /ɪ/ and /ʊ/, were subject to strengthening and weakening depending on the syntagmatic context. Word-final jers and jers before a non-jer vowel were weakened, while jers in the context of another jer in the next syllable were strengthened. The weak jers were eventually lost, while the strong jers were preserved and developed into non-jer vowels, usually /o/, /e/, /a/, or /ə/, depending on the dialect of Slavic (Bethin 1998: 104). This generalization is known as Havlik's Law. In the present analysis, the process is termed jer preservation, but the development crucially involves a merger of the remnants of

strong jers with other short vowels (vocalization, Timberlake 1988), and in this sense it represents a sound change. Following Bethin (1998), Havlik's Law can be represented as a [strong—weak] grouping of two consecutive jer syllables. For example, CS **šĭvĭcĭ*, **šĭvĭca* nom.sg., gen.sg. evolved into Ukrainian *švec'* [ʃvets'], *ševcja* [ʃewts'a] 'shoemaker' (Bethin 1998: 105).

(7)

w	[s	w]		[s	w]	
šĭ	vĭ	cĭ		šĭ	vĭ	ca
ø	e	ø		e	ø	
Ukr. [ʃvets']				Ukr. [ʃewts'a]		

While in general governed by Havlik's Law, the preservation and loss of jers was subject to certain additional constraints that differentiated dialects of LCS. Here attention is given to the conditioning of the preservation and loss of jers in Kashubian. In (8) the relevant items from Kashubian are juxtaposed with their Polish counterparts. The forms are given in the nominative singular and genitive singular or in the genitive plural and nominative singular. Modern orthography is used. The data are taken from Andersen (1970: 64–66, 1988) and from my own fieldwork conducted in central Kashubia during the summer of 2019. For several words in (8) two forms are currently in use in Kashubian. This is mainly due to (i) analogical leveling (e.g., *tidzéń* nom.sg., *tidnia ~ tidzenia* gen.sg.) and (ii) the common use of the genitive plural ending *-ów* for both masculine and feminine nouns (e.g., *córka* nom.sg., *córk ~ córków* gen.pl.) (the latter trait sets Kashubian apart from Polish).

(8)

	Kashubian		Polish		gloss
a.	czep nom.sg.	kp-a gen.sg.	kiep nom.sg.	kp-a gen.sg.	'fool'
	pies nom.sg.	ps-a gen.sg.	pies nom.sg.	ps-a gen.sg.	'dog'
	len nom.sg.	ln-u gen.sg.	len nom.sg.	ln-u gen.sg.	'flax'
	dzéń nom.sg.	dni-a gen.sg.	dzień nom.sg.	dni-a gen.sg.	'day'
	czerz nom.sg.	krz-a gen.sg.	krzew nom.sg.	krzew-u gen.sg.	'bush'
	sen nom.sg.	sn-u gen.sg.	sen nom.sg.	sn-u gen.sg.	'dream'

(8)	Kashubian		Polish		gloss
b.	marchiew nom.sg.	marchwi-e gen.sg.	marchew nom.sg.	marchw-i gen.sg.	‘carrot’
	cerczew nom.sg.	cerkwi-e gen.sg.	cerkiew nom.sg.	cerkw-i gen.sg.	‘Orthodox church’
	żôdżel nom.sg.	żôgl-a gen.sg.	żagiel nom.sg.	żagl-a gen.sg.	‘sail’
	grëdzéń nom.sg.	grëdni-a gen.sg.	grudzień nom.sg.	grudni-a gen.sg.	‘December’
	tidzéń nom.sg.	tidni-a, tidzeni-a gen.sg.	tydzień nom.sg.	tygodni-a gen.sg.	‘week’
	kòceł nom.sg.	kòtł-a, kòcł-a gen.sg.	kocioł nom.sg.	kotł-a gen.sg.	‘kettle’
	òrzéł nom.sg.	òrzł-a gen.sg.	orzeł nom.sg.	orł-a gen.sg.	‘eagle’
	òseł nom.sg.	òsł-a gen.sg.	osioł nom.sg.	osł-a gen.sg.	‘donkey’
	bãben nom.sg.	bãbn-a gen.sg.	bęben nom.sg.	bębn-a gen.sg.	‘drum’
	bąbel nom.sg.	bąbl-a gen.sg.	bąbel nom.sg.	bąbl-a gen.sg.	‘bubble’
c.	pôlc nom.sg.	pôlc-a gen.sg.	palec nom.sg.	palc-a gen.sg.	‘finger’
	kùńc nom.sg.	kùńc-a gen.sg.	koniec nom.sg.	końc-a gen.sg.	‘end’
	ptôsz-k nom.sg.	ptôsz-k-a gen.sg.	ptasz-ek nom.sg.	ptasz-k-a gen.sg.	‘bird’ dimin.
	dobëtk nom.sg.	dobëtk-ù gen.sg.	dobytek nom.sg.	dobytk-u gen.sg.	‘posses-sions’
	nokc nom.sg.	nokc-a gen.sg.	paznokieć nom.sg.	paznokci-a gen.sg.	‘fingernail’
	òct nom.sg.	òct-u gen.sg.	ocet nom.sg.	oct-u gen.sg.	‘vinegar’

(8)	Kashubian		Polish		gloss
	krzept nom.sg.	krzept-u gen.sg.	grzbiet nom.sg.	grzbiet-u gen.sg.	‘back’
	jabk, jabk-ów gen.pl.	jabk-ò nom.sg.	jabłek gen.pl.	jabłk-o nom.sg.	‘apple’
	krëszk, krëszk-ów gen.pl.	krëszk-a nom.sg.	gruszek gen.pl.	gruszk-a nom.sg.	‘pear’
	gòłąb-k nom.sg.	gòłąb-k-a gen.sg.	gołąb-ek nom.sg.	gołąb-k-a gen.sg.	‘pigeon’ dimin.
	córk, córk-ów gen.pl.	córk-a nom.sg.	córek gen.pl.	córk-a nom.sg.	‘daughter’
	róż-k nom.sg.	róż-k-a gen.sg.	roż-ek nom.sg.	roż-k-a gen.sg.	‘horn’ dimin.
	ówsnom.sg.	ówsgen.sg.	owiesnom.sg.	owsgen.sg.	‘oats’
	stół-k nom.sg.	stół-k-a gen.sg.	stoł-ek nom.sg.	stoł-k-a gen.sg.	‘stool’
	dóm-k nom.sg.	dóm-k-ù gen.sg.	dom-ek nom.sg.	dom-k-u gen.sg.	‘house’ dimin.
	dom-ecz-k nom.sg.	dom-ecz-k-ù gen.sg.	dom-ecz-ek nom.sg.	domecz-k-u gen.sg.	‘house’ double dimin.
	Witk nom.sg.	Witek-a, Witk-a gen.sg.	Witek nom.sg.	Witk-a gen.sg.	‘proper name’
	Dark nom.sg.	Darek-a, Dark-a gen.sg.	Darek nom.sg.	Dark-a gen.sg.	‘proper name’

The Kashubian data in (8a) show that when the stem contains no vowel (other than the historical jer), the jer is preserved and pronounced [ɛ] <e> or [i/ɨ] <é>. In the context of the stem-final voiced consonant (obstruent or sonorant), (8b), the jer is also preserved.[3] However, when the stem-final consonant is a

[3] Andersen (1970: 65), citing Lorentz 1958, adduces *prosba*, *proseb* ‘request’ nom.sg./ gen.pl., *lëczba*, *lëczeb* ‘number’ nom.sg./ gen.pl., and *służba*, *służeb* ‘service’ nom.sg./ gen. pl. as further examples of jer retention before voiced consonants, including voiced

voiceless obstruent, the jer is lost, (8c), counter to Havlik's Law. Polish closely mirrors Kashubian in the distribution of jers in (8a) and (8b), but not in (8c). In Polish, a jer is preserved also before voiceless obstruents. Bearing in mind that the items on the left had a jer-ending +ĭ/ŭ in LCS (today often termed a "zero ending"), it appears that while Polish complies with the general formulation of Havlik's Law, Kashubian adds a condition. A jer was preserved in potential stem-final clusters when the final consonant was voiced and in modern Kashubian it is pronounced as [ɛ] <e> or [i/i] <é>, marked as V in (9). Otherwise, the jer was lost.[4] The quality of the jer, i.e., whether the jer was front or back, was irrelevant for conditioning jer preservation.[5]

(9) Conditioning of the preservation of jers in Polish and Kashubian compared

LCS Cĭ/ŭC + ĭ/ŭ > Polish CVC
LCS Cĭ/ŭC$_{[+voiced]}$ +ĭ/ŭ > Kashubian CVC$_{[+voiced]}$

The proposed explanation of the Kashubian pattern builds on the insights of Andersen (1970), Timberlake (1983b, 1988), and Kavitskaya (2001), outlined in the previous section. Prior to the loss of the final jer, the preceding jer was subject to phonetic open syllable lengthening, which accounts for its greater perceptual salience. In addition, vowels are longer before voiced consonants than before voiceless consonants. This implies that jers were the longest in open syllables and before voiced consonants. They were shorter in open syllables and before voiceless consonants. Final jers were the most susceptible to loss, as confirmed by Łoś (1922: 24). Due to the loss of the final jer, the phonetically lengthened jer in the preceding syllable was reinterpreted as a non-jer vowel, as its length was no longer attributable to open syllable lengthening. The difference between Kashubian and Polish is related to the threshold for the phonologization of phonetic length. In Polish, the durational effects of

obstruents. These older genitive plural forms are useful in demonstrating the full conditioning of jer retention, but are rare in current usage, as they have been effectively replaced by forms in *-ów* in these and other words, i.e., *prosbów*, *lëczbów*, and *służbów*.

[4] The Kashubian words *stółk*, *dómk*, *kùńc*, *ówsˌ* and *różk* in (8c) indicate that the loss of the medial jer caused the preceding vowel /o/ to lengthen through CL when the vowel was followed by a sonorant or a voiced obstruent (though the latter context was less consistent): **stoloko* > *stōłk* > *stuwk* (Timberlake 1988: 236). CL did not apply before voiceless obstruents, e.g., *òct*. The corresponding words in Polish do not show reflexes of CL, as the medial jer was maintained in this context, e.g., *stołek* and *koniec*.

[5] For example, the final jer was front in **mrokovɪ* but back in **orılo*. The preceding jers were preserved in both cases, i.e., *marchiew* and *òrzéł*. As for the target, both the front and the back jer were preserved in the appropriate context. For example, **pısʊ* and **sʊnʊ* developed into *pies* and *sen*, respectively.

open syllable lengthening were sufficient to be reinterpreted as phonological, while in Kashubian the effects of open syllable lengthening had to be reinforced by the effects of the lengthening due to a following voiced consonant. In (10) the three contexts responsible for the fate of jers are ranked according to the effect of phonetic lengthening. Final jers were lost both in Kashubian and Polish, as they were the shortest. Both in Kashubian and Polish, jers were preserved when they were the longest, that is, when followed by a voiced consonant and another jer. Where Polish and Kashubian diverge is in the context of a voiceless consonant, that is, when they showed intermediate phonetic length. In (10) '>' indicates 'longer than', '*ĭ/ŭ*' stands for a historical jer, either front or back, and V stands for a non-jer vowel.

(10) Phonologization of phonetic length of jers in Polish and Kashubian

phonetically longer	C __ $C_{[+voice]}$ĭ/ŭ	>	C __ $C_{[-voice]}$ĭ/ŭ	>	__ #	shorter
Polish	V		V		Ø	
Kashubian	V		Ø		Ø	

Indirect support for this explanation can be found in the role played by stress, another factor that is often implicated in the longer duration of syllables. There is ample evidence that stressed syllables tend to be louder, longer, and have greater respiratory energy than corresponding unstressed syllables, though the weighting of each of these acoustic cues differs from language to language (Ladefoged and Johnson 2011: 111). In Polabian, stress played a role in the preservation of jers and they were preserved in stressed initial syllables even when they were weak, e.g., **kŭto* > *käto* 'who' (Stieber 1979: 51), cf. Kashubian *chto* and Polish *kto*. Thus, phonetic length (and perceptual prominence in general) was most likely among the factors that governed the contextual preservation of jers (and their subsequent change to non-jer vowels) in Kashubian and Polish.

3.2. Diphthongization

This section focuses on diphthongization, a process that is very characteristic of Kashubian and one which differentiates it from Polish. We begin with the description of the targets and triggers of the process and, in section 3.3, propose a listener-oriented account.

The vowel /ɔ/ is realized as [ɔ] after coronals and spelled <o>, as shown in (11a). After labials and velars /ɔ/ exhibits the diphthongized variants [wɔ] or [wɛ], spelled <ò>, as illustrated in (11b) and (11c). The change */ɔ/ > [wɔ], [wɛ] is most commonly termed "diphthongization" in descriptive sources (Breza and Treder 1981: 36–38; Jocz 2013: 86), a less common term being "labialization". The Kashubian data in this section are drawn from Breza and Treder 1981:

36–38, Jocz 2013: 86–121, and my own fieldwork conducted in central Kashubia during the summer of 2019. The IPA is used for transcription below.

(11)		transcription		spelling	gloss
a.	coronals				
		renɔ		reno	‘morning’
		tɔ		to	‘this’
		dɔbrɨ		dobrô	‘good’ fem.
		sɔstruf		sostrów	‘sisters’ gen.pl.
		rɔbits		robic	‘to do’
b.	labials				
		mwɔva	mwɛva	mòwa	‘speech’
		mwɔkrɔ	mwɛkrɔ	mòkro	‘wet’
		bwɔ	bwɛ	bò	‘because’
		pwɔd	pwɛd	pòd	‘under’
		pwɔlɛ	pwɛlɛ	pòle	‘field’
c.	velars				
		kwɔl	kwɛl	kòl	‘by’
		kwɔɲɛ	kwɛɲɛ	kònie	‘horses’
		kwɔza	kwɛza	kòza	‘goat’
		dzɛtskwɔ	dzɛtskwɛ	dzeckò	‘child’
		gwɔ	gwɛ	gò	‘him’
		gwɔdzɛna	gwɛdzɛna	gòdzëna	‘hour’
		xwɔdzɨ	xwɛdzɨ	chòdzy	‘he walks’
		sxwɔvats	sxwɛvats	schòwac	‘to hide’
		lixwɔ	lixwɛ	lichò	‘weak’

Although both diphthongal variants, [wɔ] and [wɛ], are found after non-coronals in modern Kashubian, the variant [wɛ] is generally more common in Central Kashubian, while the variant [wɔ] is found in the south-east of Kashubia, according to Breza and Treder (1981: 36–37) and Jocz (2013: 97). I include forms with the variant [wɔ], as they usefully document an earlier stage in the development of diphthongs in Central Kashubian.

Diphthongs [wɔ] and [wɛ] as reflexes of */ɔ/ are also found in word-initial position (Breza and Treder 1981: 36; Jocz 2013: 86). Just like in the context of labials and velars discussed above, two variants of diphthongs are found in Kashubian word initially: [wɔ] and [wɛ], the latter being more common in Central Kashubian. The status of the diphthongs as reflexes of */ɔ/ is supported by the Standard Polish cognates of the words in (12): *oni* [ɔɲi], *ojciec* [ɔjtɕɛts], *owca* [ɔftsa], and *oko* [ɔkɔ]. The word-initial diphthongs can be viewed as instances of historical *w*-epenthesis.

(12)	transcription		spelling	gloss
	wɔɲi	wɛɲi	òni	‘they’
	wɔjts	wɛjts	òjc	‘father’
	wɔftsa	wɛftsa	òwca	‘sheep’
	wɔkwɔ	wɛkwɛ	òkò	‘eye’

Reflexes of */vɔ/ are also realized as the diphthongs [wɔ] or [wɛ] (the latter being the principal variant in Central Kashubian) attesting to the loss of the labial fricative, */vɔ/ > [vwɔ] > [vwɛ] > [wɛ], as illustrated in (13). An important consequence of this change is the merger of the resulting [wɔ], [wɛ] (< */vɔ/) with the reflexes of word-initial */ɔ/ illustrated in (12): cf. [wɛda] *wòda* and [wɛftsa] *òwca* (Note that Polish does not show this merger: [vɔda] *woda* and [ɔftsa] *owca*.) The words in (13a) show reflexes of initial */vɔ/ and the items in (13b) illustrate non-initial */vɔ/. Jocz (2013: 100) records a handful of modern pronunciations that reflect an intermediate stage in the development of */vɔ/ > [vwɔ] > [vwɛ] > [wɛ]: [vwɛda], [tfwɛjɛ], and [sfwɛjɛ], though he notes that such realizations are rare in current usage.

(13)		transcription		spelling	gloss
	a.	wɔda	wɛda	wòda	‘water’
		wɔjna	wɛjna	wòjna	‘war’
		wɔsk	wɛsk	wòsk	‘wax’
	b.	twɔjɛ	twɛjɛ	twòje	‘your’ pl.
		swɔjɛ	swɛjɛ	swòje	‘his, her’ pl.

Similar contextual diphthongization is attested for the reflexes of */u/. After coronals, a fronted and optionally unrounded monophthongal variant is the most common, as exemplified in (14a). There is considerable interspeaker and intraspeaker variation in the realization of the vowel after coronals in Central Kashubian: [u ʉ̟ ʉ ʏ y ɨ ɪ i] (Jocz 2013: 115). After labials and velars, the most common realizations of */u/ are the diphthongal [wɨ] or [wʉ], spelled <ù>, as illustrated in (14b) and (c).

(14)		transcription			spelling	gloss
	a.	coronals				
		tʉwɛ	tɨwɛ	tiwɛ	tuwò	‘here’
		trʉp	trɨp		trup	‘corpse’
		tsʉd	tsɨd		cud	‘miracle’
		libjɔ			lubiã	‘I like’
		lʏbju			lubią	‘they like’
		tʃu	tʃiw		czuł	‘felt’
		mjɛjstsʏ			miejscu	‘place’ loc.sg.
		tʃasɨ			czasu	‘time’ gen.sg.
	b.	labials				
		pwɨstsɛts			pùscëc	‘to let’
		bwɨdɛjum			bùdëją	‘they build’
		bwɨtɛn			bùten	‘outside’
		bwʉdɨnk			bùdink	‘building’
		mwɨʃum			mùszą	‘they must’
		fwɨl			fùl	‘full’
		dvwɨx			dwùch	‘two’ gen.
	c.	velars				
		kwɨx			kùch	‘cake’
		gwɨs			gùz	‘button’
		xwɨtkwɛ			chùtkwò	‘quickly’
		kaʃəpskwɨ			(pò) kaszëbskù	‘in Kashubian’
		bzʲəxwɨ			brzëchù	‘belly’ loc.sg.
		bwɛgwɨ			bògù	‘god’ loc.sg.

Reflexes of word-initial */u/ exhibit similar diphthongal realizations (or initial epenthesis of /w/), exemplified in (15).

(15)	transcription	spelling	gloss
	wʉmar	ùmarł	‘he died’
	wɨrvawɔ	ùrwało	‘(it) fell off’
	wɨja	ùja	‘uncle’
	wɨdɨ	ùdô	‘(it) will succeed’
	wɨtʃɛts	ùczëc	‘learn’

Table 1 provides a summary of the most common contextual realizations of */ɔ/ and */u/ in Kashubian. Monophthongal variants are limited to the context of preceding coronals (T). Diphthongal variants are found after labials (P), velars (K), and word initially. In the diphthongal variants, the on-glide is labial (rounded), while the syllabic element can be labial or not.

Table 1. Context-dependent realizations of */ɔ/ and */u/ in Kashubian

context	***/ɔ/**	***/u/**
T ___	monophthong: [ɔ]	monophthong: [ʉ ʏ y ɨ i]
P ___ K ___ # ___	diphthong: [wɔ wɛ]	diphthong: [wɨ wʉ]

3.3. Evolution of Diphthongs

In tracing the origins of the diphthongal variants, we begin with the word-initial position. The vowels /ɔ/ and /u/ developed an on-glide word-initially, as shown in (16). This process will be referred to as initial epenthesis or prothesis.

(16) a. *#ɔ > #wɔ
b. *#u > #wu

In word-medial position, the vowels /ɔ/ and /u/ diphthongized after labials and velars, as schematized in (17) (based on Jocz 2013: 232–35). Subsequently, in Central Kashubian, the diphthongs /wɔ/ and /wu/, including the newly formed word-initial /#wɔ/ < /#ɔ/ and /#wu/ < /#u/, underwent partial delabialization, whereby the syllabic element lost its rounding and was fronted.

(17) a. *Pɔ > Pwɔ > Pwɛ
*Kɔ > Kwɔ > Kwɛ
#wɔ > #wɛ

b. *Pu > Pwu > Pwʉ > Pwɨ
*Ku > Kwu > Kwʉ > Kwɨ
#wu > #wʉ > #wɨ

It is proposed that word-initial epenthesis of /w/ preceded diphthongization for three reasons. First, word-initial /#wɔ/ < /#ɔ/ and /#wu/ < /#u/ along with /wɔ/ and /wu/ after labials and velars were uniformly subject to unrounding and fronting. This means that initial epenthesis most probably occurred before diphthongization. Second, the fronting process failed to apply to the /wɔ/ that resulted from a later change of /ɬ/ > /w/, e.g., *chłop* [xwɔp] 'husband' vs. *kòza* [kwɛza] 'goat'. Third, while many dialects of rural Polish show initial epenthesis of /w/, diphthongization of the vowels /ɔ/ and /u/ after consonants and their unrounding are less common (see also section 4). It thus appears that Polish dialects showing diphthongization after consonants are

a subset of dialects with initial epenthesis, rather than the other way round. Such evidence suggests that word-initial epenthesis of /w/ occurred before diphthongization after labials and velar.

3.4. Diphthongization—A Listener-Oriented Change

The crucial question to be addressed here is why diphthongization occurred after labials and velars, but not after coronals. The proposed explanation makes use of the empirical evidence testifying to the differences in the articulation, acoustics, and perception of CV sequences, with a labial or velar C, as opposed to a coronal C.

There is ample evidence that tongue tip and tongue blade movements are characterized by higher velocities than either tongue dorsum or lip movements (Kuehn and Moll 1976; Browman and Goldstein 1991: 362; Kang 1999). This means that coronal gestures are executed more rapidly than non-coronal gestures, which has important consequences for the acoustic effects of consonants with coronal as opposed to non-coronal places of articulation. Coronal gestures are rapid and, as a result, produce shorter transition cues. Non-coronal gestures are more sluggish and produce longer transition cues (Jun 2004: 63–66). Browman and Goldstein (1991) and Jun (2004) argue that this discrepancy in the length of cues provides a plausible explanation for the different propensities with which coronals and non-coronals trigger or undergo place assimilation in consonant clusters. Coronals are more commonly targets than triggers of assimilation, while for non-coronals the reverse seems to be true. This is related to Browman and Goldstein's (1991: 363–68) finding that the perceived assimilations and deletions are in fact due to the so-called "hidden gestures"—some gestures may be executed as planned, but not be fully perceptible due to masking by other gestures.

As regards gestural coordination in consonant clusters, Byrd (1996) reports on acoustic and articulatory evidence indicating that gestural overlap in coronal + non-coronal stop clusters is greater than in non-coronal + coronal clusters. Because of their shorter transition cues, tongue tip gestures are more likely to be masked by tongue dorsum or lip gestures than the other way round, all else being equal. Brown (1977) studied Received Pronunciation and found that the most common cases of assimilation involve alveolars assimilating to velars or labials. Blust (1979) investigated cluster phonotactics and provided evidence that coronal + non-coronal clusters are more susceptible to assimilation and metathesis than non-coronal + coronal clusters.

Experimental studies probing perception point to differences in the rate of recoverability of coronals vs. non-coronals. In a perception study of the identification of English voiceless stops, Winitz, Scheib, and Reeds (1972) found that in final VC sequences, vowel transitions into a stop were least informative when the C was a coronal. Vowel transitions into labials and velars were more

informative under their experimental conditions indicating that the transitions into non-coronals are more perceptually salient than those into coronals. Given the convergent evidence from articulation, acoustics, and perception, a plausible claim is that the shorter duration of transition cues for coronals than for non-coronals is a likely explanation for their different phonological behavior.[6]

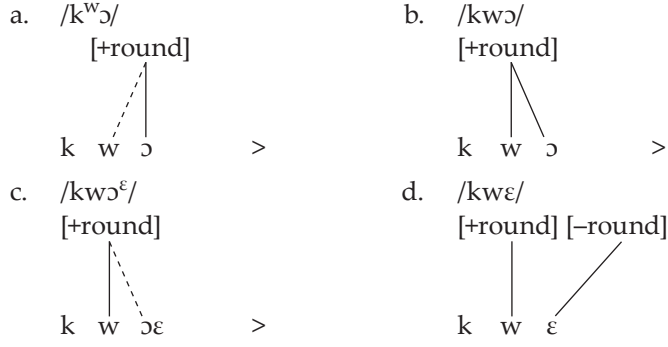
The key component of this listener-oriented explanation of the change $CV_{[+round]} \rightarrow CwV_{[+round]}$, where $V_{[+round]}$ stands for either /ɔ/ or /u/, is phonologization of the C-to-V transition cues as a homorganic glide (additional evidence for this mechanism is given in section 4.2). In the process of language acquisition, a learner is confronted with an ambiguous signal. In this case, the ambiguity is related to the formant transitions from C to $V_{[+round]}$. The sequence is realized with a transition, which, if sufficiently long, is interpretable as a glide, e.g., [C^{w}ɔ] or [C^{w}u]. The listener may attribute the formant movements during the initial portion of the vowel to the influence of the preceding consonant and phonologize the sequence as /$CV_{[+round]}$/, in accordance with the representation of the speaker. However, the listener may also interpret the formant transitions as a glide homorganic with the following rounded vowel. In such an event, the sequences /Cɔ/ and /Cu/ will be internalized as /Cwɔ/ and /Cwu/, giving rise to the phonologization of a diphthong. As outlined above, formant transitions of labials and velars are longer than formant transitions of coronals. Therefore, diphthongization via phonologization of transition cues is more likely to occur in the context of preceding labials and velars than coronals. Returning to Kashubian, the failure of coronals to trigger diphthongization thus receives a plausible explanation: the shorter formant transitions of coronals are less likely to be interpreted as a glide than are the longer formant transitions of non-coronals : T^{w}ɔ > Tɔ vs. P^{w}ɔ > Pwɔ, K^{w}ɔ > Kwɔ.

The representations in (18) outline the evolution of diphthongs in Kashubian. In the first stage, the phonological source of the feature [+round] is the vowel /ɔ/, while the transition from the preceding velar is interpreted as coarticulatory (indicated with the dotted association line), as intended by the speaker. In the second stage, the transition is reinterpreted as an on-glide, giving rise to a diphthong. The listener attributes the feature [+round] to the entire diphthong. In the third stage, the vowel receives an *e*-like off-glide, producing [wɔ^{ɛ}], and the on-glide /w/ is reinterpreted as the phonological source of rounding. This change can be conceptualized as a type of dissim-

[6] Based on such and other evidence, the studies in Paradis and Prunet (1991) argue for a special status of coronals in phonology. They argue that coronals should be underspecified, which would make them easy targets of various phonological processes. Blevins (2004: 127) points out that such an assumption is problematic, as it also predicts that coronals should be common outputs of neutralizations, for example, word-finally. Place neutralizations of non-coronals to coronals, including plosives and nasals, are relatively rare (see Blevins 2004 and citations therein).

ilation. Ohala (1981) and Blevins (2004: 31ff.) argue that the acoustic signal that contains features with extended phonetic cues may be subject to reanalysis through the mechanism of a listener-oriented change. In the course of language acquisition, coarticulated, non-local percepts need to be associated with their sources. If a listener chooses a phonological analysis of such an intrinsically ambiguous speech signal that is distinct from that of the speaker, a sound change occurs. Rounding is among the features characterized by a multisegmental span and is thus susceptible to reanalysis (Blevins 2004: 35). The acoustic signal is intrinsically ambiguous: the source of rounding can either be the entire diphthong, /wɔ/, or the initial component of the diphthong, /w/. A sound change occurs when the listener reinterprets the structure of the diphthong and attributes rounding exclusively to the first component of the diphthong. In the fourth stage of the change, the rounding of the second component is discounted as coarticulatory and factored out from the phonological representation. The syllabic component of the diphthong is reinterpreted as unrounded, thus completing the change of /kɔ/ > /kwɛ/.

(18) Evolution of diphthongs in Kashubian



A reviewer suggests that this case of diphthongization may actually be analyzed as labialization of labial and velar consonants before a rounded vowel. There are two problems with an analysis along these lines. First, it is unclear why the labialization did not take place after coronals. Second, there is no connection between word-initial glide insertion and labialization after labials and coronals. The two processes would seem unrelated. On the assumption of diphthongization, on the other hand, the prior existence of word-initial diphthongs in, for example, *òni* [wɔɲi ~ wɛɲi], is the prerequisite for the reanalysis of longer transitions after labials and velars as an on-glide of a diphthong, in accordance with the claim that hypocorrective changes tend to preserve structures rather than introduce new ones, see section 5.

4. Similar Developments in Other Languages

In order to provide further support for the listener-oriented mechanism used to elucidate the Kashubian changes, we review similar changes that occurred independently in other languages. The changes, which include initial epenthesis, emergence of glides, absorption of glides, and diphthongization, are all subjected to a listener-oriented analysis.

4.1. Initial Epenthesis

Initial epenthesis (prothesis) is commonly found in rural dialects of Polish spoken in Greater Poland (Tomaszewski 1934), in colloquial Czech, as well as in Lower and Upper Sorbian (Stieber 1934; Dalewska-Greń 2002). In Upper Sorbian the vowels [ɔ] and [u] developed prothetic [w] word-initially (spelled <w>), as illustrated in (19). Cognates from Standard Polish, which does not show initial epenthesis, are given for comparison (Dalewska-Greń 2002).

(19)	Upper Sorbian	Standard Polish	gloss
	wobdarjować	obdarować	'to reward'
	wobeschnyć	obeschnąć	'to get dry'
	wón	on	'he'
	worać	orać	'to plow'
	wučić	uczyć	'to teach'
	wucho	ucho	'ear'

Ukrainian shows remnants of the prothesis of */u/ and */o/, which was followed by changes in the quality of both the prothetic segment and the /o/ in certain positions (Rusanovskij et al. 1986: 18, 27; Czaplicki 2007: 26).

(20)					
	a.	*/u/	[ʊu] or [vu]	vúlycja	'street'
				vúxo	'ear'
				vúlyk	'beehive'
	b.	*/o/	[ʊo] or [vo]	voná	'she'
				vonó	'it'
				vohón'	'fire'
	c.	*/o/	[ʊi] or [vi]	vin < OES onŭ	'he'
				vid < OES otŭ	'from'
				viknó < OES okŭno	'window'
				víl'xa < OES olĭxa	'alder'
				vivsá < OES ovĭsa	'oat' gen.pl.
				vivcjá < OES ovĭtsja	'sheep'

The change of /w/ to a labio-dental approximant [ʋ] or a labio-dental fricative [v] can be viewed as an instance of glide strengthening. The development of [ʋi] < */o/ in (20c) merits a closer look. The vowel underwent compensatory lengthening due to the loss of a weak jer, the latter supported by the Old East Slavic (OES) forms also provided in (20c). The compensatorily lengthened vowel was subsequently unrounded, shortened, and raised: [o] > [wo] > [wo:] > [we:] > [we] > [wi] > [ʋi]. Bethin (1998: 100–101), citing Potebnja 1866, discusses supporting evidence for compensatory lengthening from Old Ukrainian texts with spellings such as <воовьця> for *vivcja* 'sheep'. In this part of Late Common Slavic length was lost by the tenth century (Shevelov 1985: 389). But note that the lengthening (and later unrounding and raising) did not apply in the items illustrated in (20b), where the requirement of a weak jer in the next syllable, necessary for CL, was not met.

The Ukrainian developments highlight two listener-oriented mechanisms of change discussed previously: compensatory lengthening and a structural reanalysis of a diphthong. Following Kavitskaya's (2001) account, in Ukrainian the phonetic lengthening in an open syllable of the sequence /CVCV/ was reinterpreted as phonemic due to the loss of a conditioning context, an ultra-short vowel: [C**V(:)**CV] > /CV:C/. The unrounding of [wo:] > /we/ is attributable to a variably diphthongal realization of the vowel before a consonant: [wo:] ~ [wo^{e}]. Such a reanalysis was more likely to affect long vowels, as diphthongal realizations are perceptually more salient in longer than in shorter syllables. The feature [+round] was eventually attributed exclusively to the on-glide of the diphthong causing the phonological unrounding of the syllabic component, [woe] ~ [w^{o}e] > /we/.

4.2. Emergence of Glides Through a Reanalysis of Transitions

Reinterpretation of formant transitions as glides is a well-documented sound change, as illustrated in (21). Complex VC transitions may give rise to a homorganic glide reinterpreted as a component of a complex nucleus (diphthong) (21a) or as a coda glide (21b). As (21c) shows, CV transitions can be reanalyzed as a glide forming a complex onset together with the initial consonant. Blevins (2008: 84–87) observes that the quality of the glide is predictable from the immediate phonetic context, that is, from the percept of the VC and CV transitions.

(21) Homorganic glide/vowel evolution (Blevins 2008: 86, citing Hock 1991: 119–20)

	language	sound change	examples	gloss
a.	American English	ʃ > jʃ, ʒ > jʒ	mæʃ > mæjʃ mɛʒɻ > mɛjʒɻ	'mash' 'measure'
b.	Old French	ɲ > jn > in	*plaɲit > plaint *poɲu > poing	'complains' 'fist'
c.	Lithuanian	pʲ > pj	*pʲautʲi > pjauti	'cut'

4.3. Absorption of Glides Through a Reanalysis of Diphthongs

The logical opposite of the emergence of glides through a reanalysis of transitions is the reinterpretation of a glide as a transition and its consequent "absorption" by the neighboring consonant. A case in point is provided by the evolution of English diphthongs. Stampe (1972) observes that in modern English the diphthong [aw] does not occur before labials and velars. He offers a historical explanation. The historical source of the diphthong [aw] is [uw]. The glide of the diphthong [uw] was reinterpreted as a VC transition into the following labial or velar, giving rise to the short [u], which in many dialects was later centralized and lowered to [ʌ] or [ə]. The absorption did not occur before alveolars and the [uw] later changed to [aw] through the Great Vowel Shift. The length of transitions conditioned the different interpretations of the diphthong before coronals and non-coronals. The shorter transitions of alveolars are less likely to be reanalyzed as glides than are the longer transitions of velars and labials. As a result, **ūt* is now [awt], but **ūp* is now [ʌp] (not *[awp]) and **dūvə* is now [dʌv] (not *[dawv]).

Similar developments have been found in Hausa (Parsons 1970; Hyman 1973). In Hausa the long /ii/ and the diphthong /ai/ do not occur before dental and palatal consonants, while the long /uu/ and the diphthong /au/ do not appear before labial and velar consonants. Hyman (1973: 335–36) argues that the Hausa restrictions on the occurrence of long vowels and diphthongs can be explained by invoking a historical mechanism similar to the one used for the English case discussed above. The back glides of [uw] and [aw] (realizations of /uu/ and /au/) were absorbed into the following labials and velars. The front glides of [ij] and [aj] (realizations of /ii/ and /ai/) were absorbed into the following dentals and palatals. Thus, the percept of VC transitions determined the target of absorption.

4.4. Diphthongization Involved in the Change of *e* > *o* in Slavic

The following discussion of the evolution of diphthongs in Slavic languages is mainly based on Andersen 1978. It provides fertile ground for testing the mechanisms of a listener-oriented change and drawing parallels with the Kashubian data. Modern Polish and Russian display /o/ ~ /e/ alternations in similar contexts, as illustrated in (22). The data are taken from Andersen 1978: 1 and given in IPA transcription.

(22) a. Polish

bzo̯za	'birch'	bzɛ̯zina	'birch grove'
zo̯na	'wife'	zɛ̯ɲskʲi	'female'
jɛ̯zɔrɔ	'lake'	pɔjɛ̯zɛ̯zɛ	'lake front'
plɔtka	'rumor'	plɛɛtɛ	'to gossip'

b. Russian

bʲerʲóza	'birch'	bʲerʲéznʲik	'birch grove'
zóni	'wives'	zénskij	'female'
ozʲóra	'lakes'	zaozʲérʲje	'area beyond a lake'
plʲótka	'whip lash'	plʲétʲ	'whip lash'

The appearance of the /o/ ~ /e/ alternations in the same contexts points either to their shared origin or parallel evolution. The contemporary /o/ ~ /e/ alternations can be traced to Common Slavic */e/. The /o/ is a result of a sound change that applied in certain dialects of Slavic. Different Slavic languages show different reflexes of the change, which indicates that the change applied in Slavic dialects to some extent independently and at a different time (Andersen 1978). The context for the */e/ > /o/ change required reference to the quality of both consonants flanking the vowel: the preceding consonant had to be palatalized, while the following consonant had to be non-palatalized. The schematic representation in (23) refers to Russian. The Polish conditioning of the change will be refined below.

(23) Russian

e > o / [+palatal] ___ [–palatal]

Reflexes of this change are also found in Ukrainian, but the conditioning of the change is not homogeneous across different dialects. There is an interesting difference between dialects of northern and southern Ukraine. In the north the change *e* > *o* applied regardless of the quality of the preceding consonant, while in the south it was restricted to the context of the preceding

/ʃ ʒ tʃ j/.[7] This difference gave rise to divergent reflexes of CS **e* after labials and dentals in northern and southern dialects of Ukrainian, as illustrated in (24a). After /ʃ ʒ tʃ j/ there is no difference between northern and southern Ukraine, as shown in (24b) (Andersen 1978, citing Filin 1972: 199ff.).

(24)		NUkr.	SUkr.	CS	gloss
	a.	sʲóli	séla	sela	'villages'
		tsʲópli	téplyj	teplŭjĭ	'warm'
		dalʲóka	daléko	daleko	'far'
	b.	utʃora	utʃora	vitʃora	'yesterday'
		ʒonati	ʒonatyj	ʒenatŭjĭ	'married'

Jakobson (1929/1962: 71ff.) provides an insightful explanation for this difference. In Proto-Russian, consonants were palatalized before front vowels and non-palatalized (velarized) before back vowels. Over time, this contextual palatalization became phonemic largely due to the loss of jers. There is evidence that the emergence of distinctively palatalized consonants happened around the same time as the *e* > *o* change (Jakobson 1929/1962: 71–72; Andersen 1978: 9–10). The context of the following /e/ did not have uniform effects on preceding consonants across dialects of Ukrainian. In the north, /e/ was responsible for palatalization of all consonants. In the south, palatalization triggered by /e/ was restricted to preceding /ʃ ʒ tʃ j/. Dentals and labials were depalatalized before /e/. Thus, the context for the *e* > *o* change given in (23) is applicable both to the northern and southern dialects of Ukrainian: the preceding consonant had to be palatalized. The difference is related to the details of palatalization: in the south, palatalization before /e/ was restricted to /ʃ ʒ tʃ j/; it did not affect dentals and labials. Whereas in the north, all consonants were palatalized before /e/ (Jakobson 1929/1962: 71ff.).

Russian shows an additional restriction of the *e* > *o* change. The change occurred in stressed syllables, as the contemporary alternations in (25) indicate.

(25)	stressed	unstressed
	ozʲóra 'lakes'	ózʲero 'lake'
	sʲóla 'villages'	sʲeló 'village'

In Polish the /ɛ/ > /ɔ/ change was restricted with respect to the place of articulation of the following consonant: the latter had to be coronal, in addition to being non-palatalized. The change did not apply before labial and velar

[7] To be precise, the discussed change occurred in weak position, that is, when the vowel escaped the context of compensatory lengthening due to the elision and eventual loss of jers (Filin 1972: 199ff.).

consonants. Compare Polish and Russian in (26) where it is shown that Russian had no similar place restriction.

(26)

Polish		Russian	
ɲɛbɔ	'sky'	nʲóbo	'palate'
tɕɛpwɨ	'warm'	tʲóplij	'warm'
lɛgw	'lay down'	lʲóg	'lay down'
tɕɛkw	'ran'	tʲok	'ran'

Polish diverges from Russian in another important aspect. The change of *e* > *o* was paralleled by the change of *ě* > *a* (*ě* traditionally stands for yat', a long open front vowel). This change is reflected in the /ɛ/ ~ /a/ alternations in Polish, but not in Russian.

(27)

Polish		Russian		CS	
vjara	vjɛzɨtɕ	vʲéra	vʲérʲitʲ	věra	věriti
'faith'	'believe'	'faith'	'believe'	'faith'	'believe'
klatka	klɛtɕitɕ	klʲétka	klʲétʲ	klětŭka	klětĭ
'cage'	'bungle'	'cage'	'cage'	'cage' dim.	'cage'

The formulation in (28) depicts the sound changes together with their conditioning in Polish which led to modern alternations of [ɛ ~ ɔ] and [ɛ ~ a].

(28) Polish

change		alternation
e > o	/ [+palatal] ___ [–palatal, +coronal]	[ɛ ~ ɔ]
ě > a		[ɛ ~ a]

An account of the changes *e* > *o* and *ě* > *a* in Slavic languages should be able to explain why they applied (i) after palatalized consonants, (ii) before non-palatalized consonants, (iii) before non-palatalized coronal consonants (in Polish), and (iv) in stressed syllables (in Russian).

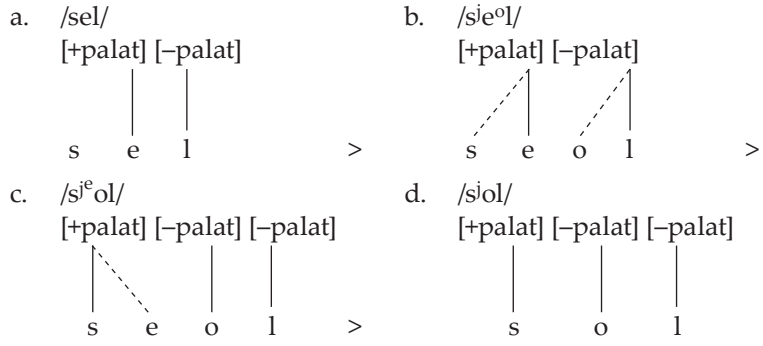
Andersen (1978) presents evidence suggesting that the change involved a stage of diphthongization. The evolution of modern Russian [sʲóla] 'villages' and [tʲóplɨj] 'warm' is shown in (29).

(29) CS *sela* > Old Russian *sʲéla* > *sʲéola* > Modern Russian *sʲóla*
CS *teplŭjĭ* > Old Russian *tʲéplŭjĭ* > *tʲéoplɨj* > Modern Russian *tʲóplɨj*

In Old Russian the vowel /e/ causes coarticulatory palatalization of the preceding consonant. Because it is followed by a non-palatalized, velarized

consonant, the vowel is diphthongal, with an /o/ off-glide, [e^{o}]. Through a hypocorrective change, the off-glide is phonologized as part of the diphthong /eo/ by the listener. However, at this stage the listener is faced with ambiguities in the acoustic signal. The resulting diphthong [eo] can be analyzed in two different ways: either [e] is the syllabic element and [o] is the off-glide, or [e] is the on-glide and [o] is the syllabic element. The former analysis coincides with that of the speaker, while the latter entails a phonological reanalysis of the diphthong by the listener. Andersen (1978) argues that there is a perceptual bias favoring the latter interpretation. The [o] portion of the diphthong is more perceptually salient because the lower second formant entails "a greater concentration of acoustic energy within a relatively narrow frequency range" (Andersen 1978: 19). Once the second component of the diphthong has been reinterpreted as syllabic, the initial portion of the diphthong may be subject to reanalysis. Bearing in mind that palatalization of consonants was already phonemic at this stage (Jakobson 1929/1962: 71–72), in [s^{j}éola] the initial portion of the diphthong could be interpreted as a C-to-V transition and accordingly "absorbed" into the preceding consonant through a hypercorrective change. This explains why the change happened after palatalized consonants: the front /e/ could not be reinterpreted as a transition from a non-palatalized consonant. As a result, the word was phonologized as /s^{j}óla/ and a reanalysis on the part of the listener had occurred. This account explains both the before and after restrictions on the context of the change and is schematically represented as the four stages in (30). Dotted lines indicate that the segment is "parasitically" (i.e., coarticulatorily) linked to a feature that has its phonological source in another segment. At the root of this mechanism lies a reinterpretation and misattribution (from the perspective of the speaker) of features with extended acoustic cues by the listener.

(30) Change of e > o in Russian



Recall that in Polish the *e* > *o* change failed to occur before non-palatalized labials and velars (e.g., Polish [ɲɛbɔ] vs. Russian [n^{j}óbo]). As mentioned in sec-

tion 3.4, coronals have shorter transition cues, while the transition cues of labials and velars are significantly longer. It is likely that the diphthong [eo] occurred before both coronals and non-coronals in Polish, just like in Russian. The difference between the two languages is related to the selective reanalysis of consonant transition cues. The [o] off-glide is more likely to be reinterpreted as V-to-C transition cues into a consonant with longer transition cues, such as a labial or a velar, than into a consonant with shorter transition cues, such as a coronal. In other words, non-coronals are more likely to "absorb" the [o] portion of the diphthong than coronals, precluding the phonologization of diphthongs. The [o] off-glide is less prone to be attributed to the short transitions into a coronal and is thus less likely to be "absorbed". This means that the [o] off-glide is more salient before coronals than non-coronals and is, therefore, more likely to find its way into the phonological representation in this context. This difference in the phonologization of diphthongs between Polish and Russian indicates that despite similar acoustic and perceptual conditions, a sound change is non-deterministic or not goal-oriented. The seeds of the change might have been uniformly present, but the phonologization proceeded under different conditions in the two languages.

Diphthongization was restricted to stressed syllables in Russian. Andersen (1978: 14) attributes this restriction to the longer duration of stressed syllables than unstressed syllables. Diphthongs developed in both stressed and unstressed syllables. However, diphthongal realizations were more salient in stressed syllables than in unstressed syllables because of their overall longer duration and greater intensity. As a result, the more perceptually salient diphthongal realizations in stressed syllables were more likely to be phonologized as such than were diphthongs in unstressed syllables.

4.5. Diphthongization Involved in the Change of *o* > *e*

In Lower Sorbian diphthongization of /o/ > /wo/ > /we/ > /e/ took place after labials and velars and is in this aspect similar to the Kashubian case discussed in section 3.4. What makes the Lower Sorbian diphthongization different from the Kashubian counterpart is the additional relevance of the following context. In Lower Sorbian diphthongization and unrounding /o/ > /wo/ > /we/ did not occur when the following consonant was labial or velar; it was restricted to the context of a following coronal, as schematized in (31) (though this restriction was later somewhat relaxed) (Stieber 1934).

(31) o > wo > we > e > i̯ / [–coronal] ___ [+coronal]
polo > pwolo > pwelo > pelo > pi̯lɔ 'field'

The preceding context receives an explanation similar to the one provided for Kashubian: the longer transition cues into the vowel of labials and velars

are reinterpreted as a homorganic glide. The following context resembles the restriction of the *e* > *o* change in Polish: it occurred before coronals. It should be noted that Lower Sorbian shows the reverse change, *o* > *e*. The context required for the change *o* > *e* is reminiscent of the change *e* > *o* in Polish and Russian in that the context for the change *o* > *e* was also double-sided. But the feature involved was different: [+palatal] ___ [–palatal]. The Lower Sorbian change is $P^{w}oT$ > PwoT > PweT and $K^{w}oT$ > KwoT > KweT. The proposed explanation invokes a reanalysis of the source of rounding. Non-coronals flanking the vowel have long transitions: *$P^{w}o^{w}K$ and *$K^{w}o^{w}P$. The delinking of the feature [+round] from /o/ in $P^{w}o^{w}K$ and its attribution to either or both of the transitional glides is unlikely, as /o/, being in the center of the acoustic span of this feature, is the most likely source of rounding. In contrast, in $P^{w}oT$, the rounding can be attributed to the on-glide, as it does not extend to the shorter transition into the following coronal. An additional restriction that blocked a reinterpretation of the vowel between non-coronals might have been structural. Phonologization of the two long transitions as glides was unlikely, as a triphthong would result, /wow/, and triphthongs are not found in Lower Sorbian.

As a result of the reattribution of the feature [+round] to the glide, the syllabic element of the diphthong was unrounded (though not in all dialects). Subsequently, the on-glide was lost leaving behind the unrounded monophthong /ɛ/ or /ɨ/. The realizations of */o/ vary in modern Lower Sorbian dialects, as the data in (32) demonstrate (Faßke 1990).

(32) pólo [pɨlɔ] ~ [pɛlɔ] ~ [pʊlɔ] ~ [pɔlɔ] ‘field’
kóza [kɨza] ~ [kɛza] ~ [kɔza] ‘goat’

Nitsch (1939) mentions that diphthongization of /o/ > /wo/ is also common in rural dialects of Polish. He notes that the process occurs after all consonants, though he adds that it is more common after labials and velars than after coronals. Polish does not show the unrounding of the syllabic component.

4.6. Evolution of Rounded Vowels: A Summary

Table 2 on the following page provides a summary of the developments of rounded vowels /ɔ/ and /u/ in the Slavic languages discussed. The table shows a continuum of languages from the most conservative on the left to the most innovative on the right with respect to the evolution of /ɔ/ and /u/. Each language was subject to the change indicated underneath, as well as the changes to the left. Standard Polish does not show any relevant changes of the vowels. Rural Polish shows initial epenthesis. Ukrainian is included here to illustrate the subsequent process of glide strengthening. Kashubian 1 shows the emergence of diphthongs after labials and velars, found in the southeastern dia-

Table 2. The evolution of the rounded vowels /ɔ/ and /u/ in Slavic

St. Polish	Rural Polish, Ukrainian*	Kashubian 1	Kashubian 2	Lower Sorbian
#ɔ	#ɔ > #wɔ	$P^{w}ɔ$ > Pwɔ	Pwɔ > Pwɛ	Pwɛ > Pɛ
#u	#u > #wu	$K^{w}ɔ$ > Kwɔ	Kwɔ > Kwɛ	Kwɛ > Kɛ
		$P^{w}u$ > Pwu	#wɔ > #wɛ	
	*Ukr. … #wɔ > #ʊɔ	$K^{w}u$ > Kwu	Pwu > Pwɨ	
	… #wɔ(:) > … > #ʊi		Kwu > Kwɨ	
	… #wu > #ʊu		#wu > #wɨ	

lects of Kashubian today. Kashubian 2 shows the unrounding and fronting of the second component of the diphthong (also in word-initial position) and represents Central Kashubian today. Lower Sorbian illustrates the loss of the on-glide, which completes the development of /ɔ/ > /ɛ/ after non-coronals.

5. Hypo- and Hypercorrection Theory Applied to Diphthongization and Changes in the Jers

We return to Ohala's distinction between listener-oriented changes due to hypocorrection and hypercorrection, introduced in section 2. Hypocorrection involves a reanalysis of a phonetic property as phonological, while hypercorrection occurs when the listener associates a feature with a different phonological source than does the speaker.

An explanation involving hypocorrection can be applied to changes in the jers in Kashubian and diphthongization in Kashubian and Russian. As repeated in (33a-i), phonetic length due to an open syllable and the following voiced consonant is reanalyzed as phonological when the final jer is lost. In the diphthongization in (33a-ii), long C-to-V transitions out of labials and velars are reanalyzed as an on-glide, e.g., $p^{\bar{w}}ɔ > pwɔ$, (partly) inducing the phonologization of a diphthong. In the Russian change illustrated in (33a-iii) V-to-C consonant transitions, where the C is velarized, are reanalyzed as an off-glide of a diphthong.

The mechanism of hypercorrection can be used to motivate the various stages in the development of Kashubian, Russian and English diphthongs. As repeated in (33b-i), diphthongization in Kashubian included a stage when [+round] was factored out from the syllabic component of the diphthong and attributed solely to the on-glide, *wɔ > wɛ*. The Russian case, repeated in (33b-ii), shows that an entire segment has been factored out. In the sequence of a contextually palatalized consonant followed by the diphthong [eo], e.g., [s^{j}eo],

palatalization can either be attributed to the vowel [e], in accordance with the representation of the speaker, or to the consonant, leading to a sound change. In the latter case, the initial portion of the diphthong [eo] can be reanalyzed as a transition from the palatalized consonant to the back vowel [o] and factored out from the phonological representation, [sʲeo] > /sʲo/. The initial portion of the diphthong is thus absorbed by the palatalized consonant. The prerequisite for this reanalysis was the existence of distinctively palatalized consonants in LCS. Finally, the English example in (33b-iii) shows that the glide in [uw] has been reinterpreted as a VC transition before labials and velars and factored out from the phonological representation.

(33) A typology of hypocorrective and hypercorrective changes

a. Hypocorrection		
i. Kash.	$C\check{\imath}/\check{u}C_{[+voiced]}\check{\imath}/\check{u} > C\varepsilon C_{[+voiced]}$ $C\check{\imath}/\check{u}C_{[-voiced]}\check{\imath}/\check{u} > CC_{[-voiced]}$	phonetic length reinterpreted as phonological
ii. Kash.	p^{w}ɔlɛ > pwɔlɛ	CV transitions reinterpreted as phonological
iii. Russ.	sʲe^{o}la > sʲeola	VC transitions reinterpreted as phonological
b. Hypercorrection		
i. Kash.	pwɔlɛ > pwɛlɛ	a phonological element attributed to a different source
ii. Russ.	sʲeola > sʲola	a phonological element reinterpreted as CV transitions
iii. Eng.	uwp > up (> ʌp)	a phonological element reinterpreted as VC transitions

The changes in (33) highlight an important issue related to the listener-oriented approach to change. Hypo- and hypercorrection involve the opposite mechanisms: (i) a phonetic property is reinterpreted as phonological, and (ii) a phonological property is reinterpreted as coarticulatory and factored out. This suggests that each of the two mechanisms of change is equally likely to occur in a particular case. While it is true that language change is essentially unpredictable, Ohala (1989) argues that there are important conditions that determine the likelihood of each mechanism. A hypocorrective change is facilitated by the loss of the environment that condition the phonetic property. For example, the loss of final jers gave rise to the phonologization of phonetic length on preceding jers in Kashubian. Blevins (2004: 153–55) elaborates

on this point and adds that hypocorrective changes are more likely to preserve structure than introduce new elements. Speakers of a language with pre-existing vowel length contrasts are more likely to phonologize phonetic length than speakers of a language without length distinctions simply because they are more sensitive to vowel length distinctions. Diphthongization after labials and velars in Kashubian in (33a-ii) was set in motion by the earlier initial epenthesis *#ɔ > #wɔ*. The latter change led to the emergence of diphthongs in the language, thus paving the way to the phonologization of diphthongs after non-coronals.

As hypercorrective changes involve reanalysis of the phonological source of a phonetic effect, the most likely features to undergo such changes are those with extended phonetic cues. The fact that rounding and palatalization are among such features provides support for the account involving a shift of the phonological source of rounding from the syllabic component to the on-glide of a diphthong in Kashubian in (33b-i), the shift of the phonological source of palatalization from a vowel to the preceding consonant in Russian in (33b-ii), and reinterpretation of a glide as a transition into a labial or velar consonant in English in (33b-iii). As these cases of diphthongization indicate, hypo- and hypercorrective changes may follow in succession. A hypocorrective change may be directly followed by a hypercorrective change, or the other way round. This is to be expected, given that sound change is largely unpredictable, even though its seeds are universally present.

6. An Alternative Analysis

Admittedly, many of the changes discussed above can be analyzed by invoking rules or constraints referring to natural classes defined in articulatory or acoustic terms, as is done in many generative accounts of sound change (e.g., Kiparsky 1995). For example, the emergence of diphthongs after labials and velars in Kashubian (*pɔ > pwɔ*, *kɔ > kwɔ*) can be loosely stated as in (34), where rounded vowels receive an on-glide after labials and velars (G stands for a glide, C for a consonant, and V for a vowel). This formalization is problematic as it is not clear why the diphthongization occurs after labials and velars to the exclusion of coronals.

(34) Kashubian diphthongization—first attempt

G	C	V
ø → [+rounded]	/[–coronal] ___	[+rounded]

In an attempt to reduce the arbitrariness of the statement in (34), one could appeal to the acoustic feature [grave], where [+grave] segments are defined by the concentration of energy in the lower frequencies of the spectrum (Jakob-

son and Halle 1956). Segments marked [+grave] include labial consonants, velar consonants, and back vowels. Thus, with the aid of the feature [grave] the segments involved in the Kashubian diphthongization form a natural class. The rule receives the improved formulation in (35).

(35) Kashubian diphthongization—second attempt

$$\begin{array}{ccccc} & & G & C & V \\ \text{ø} & \rightarrow & [+\text{grave}] & / [+\text{grave}] \_\_ & [+\text{grave}] \end{array}$$

While the rule in (35) adequately captures the affinity of the segments involved in the process, it is still unclear why the diphthongization (or glide insertion) occurred in the first place. An explanation that appeals to the reduction of markedness as the driver of the process is difficult to maintain without running the risk of being ad hoc. In other words, although formulations such as (35) attain descriptive accuracy, they have limited explanatory and predictive power. The proposed listener-oriented approach is preferable, as it is based on empirically verifiable articulatory, acoustic and perceptual evidence.

7. Conclusion

It has been shown that the listener-oriented approach to change provides an insightful explanation for historical processes that resulted in synchronic alternations in modern Kashubian. The conditioning of these changes finds an explanation in acoustic and perceptual factors. In the case of the preservation of jers, phonetic length resulting from an affiliation with an open syllable and the context of a following voiced consonant is phonologized when the conditioning context is lost. As regards diphthongization, the relatively long formant transitions of non-coronals are phonologized as on-glides of diphthongs. The failure of other contexts to trigger similar changes has also received a plausible perception-based explanation. For example, insufficient phonetic length resulted in the loss of jers before voiceless consonants and the C-to-V transitions after coronal consonants were not long enough to be phonologized as an on-glide of a diphthong by the listener.

The Kashubian changes have been situated in the larger context of similar changes in other languages, providing further support for the proposed explanations. A typology of listener-oriented changes has emerged, where phonetic factors **to some extent** determine the probability that a given change will occur. For example, the longer the phonetic duration of a vowel in a particular context, the more susceptible the vowel is to the phonologization of length when the conditioning context is lost. The longer the formant transitions of a consonant into and out of a vowel, the more likely it is that a diphthong will be phonologized.

Finally, the discussion has provided support for the non-deterministic nature of sound change. As both hypocorrection and hypercorrection are usually involved in language acquisition, the seeds of change are universally present. Whether a given change will occur or not cannot be fully predicted, as change is not goal-oriented or teleological. Yet, there appear to be conditions that induce certain types of change. For example, in hypocorrective changes, the prior existence of a certain structure in the language facilitates the emergence of this structure in different contexts: The pre-existence of word-initial diphthongs prompts their phonologization word-internally. Hypercorrective changes are predicted to occur when a feature with a long acoustic span is involved. It has also been shown that hypo- and hypercorrective changes are often interspersed in the evolution of a phenomenon, as both mechanisms rely on resolving ambiguities in the phonetic signal, though in opposite ways.

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