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Postalveolar co-occurrence restrictions in Slovenian

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Abstract This paper shows that a postalveolar co-occurrence restriction (Obligatory Contour Principle, OCP) is a productive component of Slovenian phonology. We first examine whether an apparent OCP-based restriction on derived palatalization, previously observed in corpus data (Jurgec 2016), extends to novel forms via a goodness-rating task. We then explore the generality of the restriction across the lexicon, in non-derived novel words as well as derived forms. Our results confirm that listeners judge derived palatalized nonce forms to be less acceptable when the stem contains another postalveolar, reflecting the pattern found in the previous corpus study. We further demonstrate that multiple postalveolars are dispreferred even in non-derived words, which suggests that the effect is a general case of OCP. This is additionally supported by effects of proximity (the restriction is stronger for postalveolars separated only by a single vowel than for those further apart from one another) and identity (the restriction is stronger for identical than non-identical postalveolars), reflecting cross-linguistic tendencies in the manifestation of OCP and non-local consonant dissimilation. Finally, we show that the restriction does not appear to apply to all places of articulation, suggesting that the co-occurrence restriction in Slovenian specifically targets postalveolars, and adding a previously unattested pattern to the typology of OCP phenomena on consonant place.

Keywords palatalization · OCP · dissimilation · laboratory phonology · Slovenian

1 Introduction

A growing body of literature has shown that statistical trends in the lexicon are part of speakers' phonological knowledge. For instance, Ernestus and Baayen (2003) show that Dutch speakers'

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productions of nonce words reflect distributional characteristics of the Dutch lexicon, with velars in root-final position eliciting relatively more voicing than labials and coronals. Becker et al. (2011) demonstrate that Turkish speakers mirror the distribution of laryngeal alternations in the Turkish lexicon in terms of size of the nominal stems and place of articulation of word-final stops, with longer words and labials preferring more alternations. As well, Kager and Pater (2012) show that Dutch speakers have internalized the underrepresentation of sequences of long vowels, a consonant and a non-coronal consonant, extending it to nonce words. However, not all trends in the lexicon are productively extended to nonce words. In Becker et al. (2011), for instance, the lexicon displays different rates of laryngeal alternation in stops depending on vowel quality, but this was not mirrored in the nonce word task. Moreover, when the trends do not offer evidence for a cross-linguistically attested asymmetry, speakers may nevertheless display such an asymmetry in nonce word tasks. For instance, Hayes et al. (2009) demonstrate that speakers are biased towards learning natural over unnatural processes in Hungarian. Hayes and White (2013) demonstrate that English nonce words violating natural constraints were rated lower than those violating unnatural constraints. Becker et al. (2012) demonstrate that while English does not offer strong evidence for initial-syllable faithfulness—a cross-linguistically well-established asymmetry—English native speakers nevertheless display a preference for protecting initial syllables in artificial grammar experiments.

This paper focuses on a co-occurrence restriction observed in the Slovenian lexicon. In Slovenian, stem-final velars are often palatalized when followed by certain suffixes (e.g. *dlak-a* 'hair' ∼ *dla**ʧ**-itsa* 'hair-DIMINUTIVE'); however, recent work has shown that this palatalization is underattested when the stem contains a non-adjacent postalveolar (e.g. *ʧərk-a* 'letter' ∼ *ʧərk-itsa*, **ʧər**ʧ**-itsa* 'letter-DIMINUTIVE'; Jurgec 2016). We ask whether the knowledge that Slovenian speakers have about the distribution of palatalization in their lexicon extends to novel words. We first conducted an experiment in which participants rated the acceptability of palatalized derived nonce words. The results reveal that palatalized words with a postalveolar in the stem had lower acceptability ratings when compared to words without postalveolars. Thus, it appears that the postalveolar "blocking" effect is a productive generalization in Slovenian speakers' phonological grammars. In our second experiment, we asked participants to rate acceptability of both palatalized and non-palatalized derived words, as well as non-derived words with two postalveolars. Participants' responses patterned similarly for derived and non-derived forms, indicating a general co-occurrence restriction on postalveolars across the lexicon, and the results also reinforced the productivity of both palatalization in derived words.

Our results suggest that Slovenian speakers have a fully general co-occurrence restriction on multiple non-adjacent postalveolars within a word, applying in derived and non-derived environments alike, extending the findings of Jurgec (2016). This, however, is not a categorical restriction as words with multiple postalveolars are only underrepresented (vs. unattested) in the corpus, and have only slightly lower goodness ratings in our experimental tasks. Such dissimilatory tendencies have been reported for a variety of languages. For instance, Arabic has co-occurrence restrictions that apply to all consonant places and manners (Pierrehumbert 1993; Frisch et al. 2004), even though the restrictions are less strong for coronals (Coetzee and Pater 2008). Japanese rendaku limits voiced obstruents within a word, and while this restriction is nearly categorical in native Yamato words, speakers extend the tendency productively to novel words in a gradient fashion, with certain combinations being over- or under-represented (Kawahara and Sano 2014a,b). Korean exhibits nearly categorical tensification of the initial obstruent in the second stem of compounds, but this tends to be blocked if the stem contains another tense obstruent, albeit not categorically (Ito 2014). Japanese and Korean exhibit laryngeal restrictions, while Slovenian adds a new dimension to the typology by showing similar tendencies with a place feature. Co-occurrence restrictions are often attested with laryngeal features, nasality, and laterality. As for place, labial dissimilation is frequent (such as in Tashlhiyt Berber; El Medlaoui 1995; Odden 1994; Alderete 1997), while coronal dissimilation is less so (Akan; Welmers 1945; McCarthy and Prince 1995). Slovenian involves postalveolars, adding to the cross-linguistic typology of place feature co-occurrence restrictions.

The Slovenian data are consistent with the cross-linguistic generalizations about co-occurrence restrictions, OCP, or dissimilation (recent surveys include Suzuki 1998; Alderete and Frisch 2007; Bye 2011; Bennett 2015). First, co-occurrence restriction tendencies across a vowel are more common or stronger than dissimilatory tendencies at longer distances, all other things being equal. Our results mirror this fact: words of the type CVŠVŠ (where Š stands for any postalveolar) had lower acceptability ratings when compared to ŠCVCŠ. Second, co-occurrence restrictions are often sensitive to the identity between the interacting segments. There are at least two cross-linguistic tendencies: one kind shows fewer co-occurrence restrictions when the segments are identical (Gallagher and Coon 2009; Gallagher 2010b), whereas the other shows the opposite, namely stronger co-occurrence restrictions when segments are identical (Vance 1991; Pierrehumbert 1993). Our experiments confirm that Slovenian is of the second kind: identical postalveolars lead to lower acceptability ratings. Third, the co-occurrence restrictions in Slovenian do not apply to all places of articulation without distinction, but instead appear to affect a particular set of consonants. We found that multiple velars do not have the same negative effect on acceptability as multiple postalveolars do, even though both types of co-occurrences are underrepresented in the lexicon. This contrasts with the patterns observed in Arabic, among many other languages, where co-occurrence restrictions apply across all kinds of consonants (Pierrehumbert 1993; Frisch et al. 2004).

This paper is organized as follows. Section 2 provides more background about co-occurrence restrictions on postalveolars observed in Slovenian palatalization. Next, Section 3 presents the first experiment, examining whether the apparent blocking effect in derived forms found in Jurgec (2016) forms a part of Slovenian speakers' synchronic grammar. Section 4 extends the inquiry to non-derived forms, as well as derived forms without palatalization. Finally, Section 5 provides the broader discussion.

2 Postalveolar co-occurrence restrictions in Slovenian velar palatalization

Postalveolar co-occurrence restrictions in Slovenian have first been observed in connection with palatalization, which will be discussed in this section.

Slovenian distinguishes 20 consonantal phonemes, with two additionally appearing in loanwords, shown in parentheses in Table 1. Palatalization involves velar and postalveolar obstruents.

	Labial		Coronal				Velar	
			Alveolar		Postalv.			
Stop	p	b	t	d			k	g
Affricate			ts	(ʣ)	ʧ	(ʤ)		
Fricative	f		s	z	ʃ	ʒ	x	
Nasal		m		n				
Rhotic				ɾ				
Lateral				l				
Approximant		ʋ				j		

Table 1: Slovenian consonant inventory (Toporišič 1976/2000; Šuštaršič et al. 1995; Jurgec 2007). Only the allophones appearing in prevocalic positions are shown.

Slovenian palatalization is a process that turns stem-final velar obstruents into postalveolars, when followed by certain suffixes (Toporišič 1976/2000:151–153,262–264). The data in (1) show that all velars map to postalveolars with the same voicing in certain suffixed words.

(1) Velar palatalization: velars {k, g, x} palatalize to postalveolars {ʧ, ʒ, ʃ}

baɾ**k**-a	'boat'	baɾ**ʧ**-itsa	'boat-DIMINUTIVE'
mle**k**-o	'milk'	mle**ʧ**-nat	'milk-ADJECTIVE'
dla**k**-a	'(a piece of) hair'	dla**ʧ**-je	'hair-COLLECTIVE'
kɾo**g**-a	'circle-GEN'	kɾo**ʒ**-əts	'circle-DIMINUTIVE'
sne**g**-a	'snow-GEN'	sne**ʒ**-ina	'layers of snow'
ju**g**-a	'(the) south-GEN'	ju**ʒ**-ən	'south-ADJECTIVE'
pɾa**x**	'dust'	pɾa**ʃ**-ək	'powder'
ʋəɾ**x**	'peak'	ʋəɾ**ʃ**-iʧ	'peak-DIMINUTIVE'

Cross-linguistically, palatalization is more likely to be triggered by front or high vowels (Bhat 1978; Bateman 2007; Kochetov 2011), but this does not seem to be the case in Slovenian. While some suffixes in (1) begin in the high front vowel [i] or glide [j], others have an initial schwa or even a consonant. Moreover, not all i-initial suffixes trigger palatalization (e.g. [bo**g**-inja] 'female god' versus [u-bo**ʒ**-itsa] 'poor woman'). Palatalization is thus morphologically conditioned and triggered by certain suffixes that have no common phonological properties, resembling Serbo-Croatian (Browne 1993; Morén 2006).[1]

Jurgec's (2016) corpus study, which consists of 612 types and 5.7 million tokens extracted from Gigafida (a 1.2 billion word written corpus of Slovenian; Logar-Berginc et al. 2012), revealed a previously unknown restriction which will be the focus of this paper. Palatalization appears to be much rarer with stems containing a non-adjacent postalveolar, a generalization which holds regardless of the combination of postalveolars or the distance between them. The examination of the corpus frequencies revealed that palatalization is generally variable, as shown in (2-a), but this variation is crucially restricted: when a root contains a postalveolar, the palatalized varieties are unattested (2-b).

(2) Variation in Slovenian palatalization

a. Variation in roots without postalveolars

STEM		NON-PALAT.	PALATALIZED	% PAL	TOKENS	
baɾok	'baroque'	baɾo**k**-ən	baɾo**ʧ**-ən	99.8	10,466	'baroque-ADJECTIVE'
stɾaŋk-a	'party'	stɾaŋ**k**-itsa	stɾan**ʧ**-itsa	88.3	206	'party-DIMINUTIVE'
gɾax	'pea'	gɾa**x**-ək	gɾa**ʃ**-ək	55.7	341	'pea-DIMINUTIVE'
kɾok	'circle'	kɾo**g**-əts	kɾo**ʒ**-əts	9.0	4,804	'circle-DIMINUTIVE'

b. Postalveolars in the root block palatalization

STEM		NON-PALAT.	PALATALIZED	% PAL	TOKENS	
ʒag-a	'saw'	ʒa**g**-ən	ʒa**ʒ**-ən	0.0	15	'saw-ADJECTIVE'
ʃʧɪɾk-a	'daughter'	ʃʧɪɾ**k**-itsa	ʃʧɪɾ**ʧ**-itsa	0.0	5,335	'daughter-DIMINUTIVE'
ʃpɛx	'fat'	ʃpɛ**x**-ək	ʃpɛ**ʃ**-ək	0.0	18	'fat-DIMINUTIVE'
ʧuk	'owl'	ʧu**k**-əts	ʧu**ʧ**-əts	0.0	405	'owl-DIMINUTIVE'

[1] Slovenian also has other kinds of palatalization with other suffixes as well as local alternations that interact with palatalization, which lie beyond the scope of this paper. For instance, iotatization/iotation affects all consonants, palatalizing most coronals and velars, but epenthesizing [j] after coronal sonorants and [lj] after labials. Velar fronting, which is limited to one productive morphological context, turns velars into alveolar continuants (Toporišič 1976/2000:262–266; Herrity 2000:24-26; Jurgec 2007:106–109). Moreover, phonotactics restrict consonant clusters involving coronals and labials, which can resemble palatalization. For instance, sequences of velar + sibilant + velar are not possible (/aɾxeolog-ski/ → [aɾxeoloʃki] 'archeological'). Finally, all adjacent sibilants must agree in anteriority.

While Jurgec's (2016) corpus study revealed a strong blocking effect, it is not exceptionless. There are exceptions to the blocking generalization, including a few instances of 100% palatalization even in roots with a second underlying postalveolar. To examine these results more closely, Table 2 breaks down the corpus data by various parameters, which will play a significant role in this paper.[2] For each level, we calculated mean palatalization rates by token. The mean palatalization rate is higher in roots without a postalveolar when compared to stems in which postalveolar is far away from the right stem edge. The rate of palatalization is even lower in stems where the postalveolar is just one vowel away from the final consonant. Yet non-final postalveolars are infrequent in stems (42 stems, or 7%). There are also a few other differences: *x* exhibits overall lower palatalization rates than the other two velars, the blocking *ʧ* and *ʒ* appear to lower palatalization more than *ʃ*. Individual suffixes vary greatly in their palatalization rates, ranging from 35.9% for *-əts* 'DIMINUTIVE' to 98.5% for *-je* 'COLLECTIVE'.

Factor	Levels	Mean % Pal	n	Example	
Position of postalveolar	Absent	74.5	569	knjig-itsa	'booklet'
	Distance > 2 segments	50.5	30	**ʧ**ərk-itsa	'letter-DIM'
	Distance = 2 segments	20.0	12	ma**ʧ**ex-itsa	'step-mother-DIM'
Stem-final Target	k	73.4	332	bi**k**-iʧ	'bull-DIM'
	g	75.2	167	brе**g**-iʧ	'slop-DIM'
	x	64.7	112	ore**x**-ək	'walnut-DIM'
Postalveolar Type	ʧ	39.6	14	**ʧ**lank-iʧ	'article-PEJOR'
	ʒ	33.4	12	de**ʒ**nik-ək	'umbrella-DIM'
	ʃ	61.5	13	du**ʃ**ik-ən	'nitrogen-DIM'
Suffix	-je	98.5	59	otok-**je**	'archipelago'
	-iʧ	98.1	20	rog-**iʧ**	'horn-DIM'
	-ina	93.3	36	globok-**ina**	'depth, deepness'
	-ən	89.5	169	pobog-**ən**	'religious'
	-ək	86.9	92	ʃpɛx-**ək**	'fat-DIM'
	-nat	69.4	17	breg-**nat**	'steep'
	-itsa	44.4	106	razlik-**itsa**	'difference-DIM'
	-owje	36.0	26	dlak-**owje**	'lots of hair'
	-əts	35.9	86	kak-**əts**	'excrement'

Table 2: Mean palatalization rates in Jurgec's (2016) corpus by various parameters. Non-palatalized forms are shown as examples. n refers to the number of distinct word types in each category; each derived word is counted as 1 regardless of case inflection.

The effect of different variables and relative rarity of stems with postalveolars raise some doubts whether palatalization blocking is truly robust in Slovenian. A subsequent study by Zymet (2018), which examines lexical propensities in Slovenian palatalization and uses a different Slovenian corpus, found that the blocking effect is not fully general and applicable to all suffixes. Both corpus-based studies thus no longer offer indisputable evidence for non-local blocking.

This paper reexamines the evidence for non-local postalveolar blocking. Following the large body of work on other languages (Albright and Hayes 2003; Ernestus and Baayen 2003; Hayes et al. 2009; Hayes and White 2013; Becker et al. 2011, 2012; Kager and Pater 2012, as reviewed in Section 1) we posit that if asymmetries found in the lexicon are part of speakers' phonological knowledge, we expect them to be extended to novel lexical items. This is particularly true for asymmetries that are found across many languages. Slovenian palatalization blocking is a case of co-occurrence restrictions (OCP or non-local dissimilation) involving consonantal place, and while no known case of such restrictions is specific to postalveolars, place-based co-occurrence re-

[2] Of the original 612 types, we excluded one due to homophony with a stem with an underlying postalveolar.

strictions are common (Suzuki 1998:66–80,152–158; Alderete and Frisch 2007; Bye 2011; Bennett 2015:329–358).

If Slovenian presents a case of postalveolar co-occurrence restrictions, we also expect to see effects of proximity, which has been found to have an effect in a variety of OCP phenomena. Korean, for instance, shows lower tensification rates when the tense consonant blocker is across a vowel as opposed to when it is more distant (Ito 2014). Japanese shows geminate devoicing that is also sensitive to proximity (Kawahara and Sano 2013). Arabic place OCP is also sensitive to proximity (Frisch et al. 2004). Suzuki (1998) provides a typological survey of dissimilation which incorporates distance as a core parameter of his constraints based on OCP. Zymet's (2015) model incorporates distance-sensitivity based on dissimilation data from Malagasy, Latin, and English.[3] Thus, our work has the potential to add to this literature through examination of a particular combination of phonological and morphological factors that is not attested cross-linguistically, even though a subset of similar patterns is attested.

In what follows, we first present results of a judgment task in which Slovenian speakers rate the acceptability of morphologically derived palatalized nonce words (Experiment 1). Differences in acceptability ratings between items with stem-internal postalveolars and those without suggest that the blocking effect is a productive element of Slovenian speakers' phonological knowledge. Once this is established we can ask the next question (Experiment 2): is the postalveolar co-occurrence restriction limited to palatalization and to derived (suffixed) words, or is it part of a larger, more general pattern? We will see that the latter is indeed the case.

3 Experiment 1: Postalveolar co-occurrence restrictions in derived palatalized words

We first ask whether the dissimilatory tendencies observed in the corpus are productive. In other words, do speakers of Slovenian extend the co-occurrence restrictions observed in the corpus to novel forms? In doing this, we follow a growing body of literature (Zuraw 2000; Albright and Hayes 2003; Ernestus and Baayen 2003; Hayes et al. 2009; Hayes and White 2013; Becker et al. 2011, 2012; Kager and Pater 2012, among many others) and conduct a nonce word judgment task in which native Slovenian speakers rated the acceptability of derived palatalized nonce words. Our primary comparison of interest is whether the presence/absence of a postalveolar in the base modulated participants' acceptability ratings. If the apparent long-distance blocking effects found in corpus work (Jurgec 2016), discussed above, form a part of speakers' phonological knowledge, we expect to find that palatalized forms of suffixed words are dispreferred when the base contains a postalveolar segment. As we will see below, the postalveolar co-occurrence restrictions are indeed extended to derived nonce words.

3.1 Methods

Base forms used for this experiment were phonotactically legal disyllabic nonce words, semi-randomly generated to vary on several parameters (summarized in Table 3). These base forms were of the shape $\mathrm{C_{INIT}VC_{MED}VC_{FIN}}$, which conforms to the basic template of native Slovenian roots (i.e. no hiatus and C-final, Jurgec 2007). The base-final consonant, $\mathrm{C_{FIN}}$, was always an underlying velar obstruent {k, g, x}, which are potential targets for palatalization in derived forms.

[3] Note that although proximity has a strong effect in distant co-occurrence restrictions/OCP, Bennett (2015) has shown that strictly local dissimilation is typologically unlike distant dissimilation. Moreover, dissimilation may apply exclusively to segments in the same prosodic position, thus applying to adjacent onsets, but not to the coda between them.

Factor	Levels	Example Item
Position of postalveolar	Absent	mebuk-itsa
(BLOCKERPOSITION)	C_{INIT}	**ʧ**unok-itsa
	C_{MED}	ɾi**ʧ**ak-itsa
Word-final Target	k	droʒa**k**-iʧ
(C_{FIN})	g	tuɾe**g**-itʃ
	x	ʧuja**x**-ək
Postalveolar Type	ʧ	vi**ʧ**ag-ən
(BLOCKERTYPE)	ʒ	**ʒ**oluk-iʧ
	ʃ	ɾa**ʃ**ax-ək
Suffixal trigger	-itsa	ladeg-**itsa**
(SUFFIX)	-iʧ	debog-**iʧ**
	-ək	bodak-**ək**
	-ən	mleʒag-**ən**

Table 3: Summary of parameters for nonce word generation

We used three postalveolars as potential blockers (BLOCKERTYPE): {ʧ, ʒ, ʃ}. These blockers occurred in either initial (C_{INIT}) or medial (C_{MED}) position of the base (BLOCKERPOSITION). Each base form was combined with one of four existing SUFFIXES of Slovenian: {-itsa, -iʧ, -ək, -ən}. We matched these forms with an equal number of corresponding items with the same parameter settings but lacking a postalveolar (BLOCKERPOSITION = Absent), for a total of 144 items. All segments not specified by experimental conditions were randomly generated from a set of frequent consonants and vowels.[4] When random generation resulted in a real word, these were replaced with a new randomly generated nonce word with the same parameters until a true nonce word was found. Stimuli are listed in the Appendix, Tables 8–10.

Participants: 59 native speakers of Slovenian, ranging in age from 20 to 69 years old (mean 38 years) participated in the experiment. All were born and spent their formative years in Slovenia. The participants grew up in all dialectal regions and were roughly representative of the relative number of speakers from those regions (31 from the central dialects, 16 from the north-east, 9 from the south-west, and 3 unknown). Participants were recruited via mailing lists, word of mouth, and through social media.

Procedure: The fact that Slovenian orthography distinguishes the relevant consonant contrasts allowed us to present the experiment as a written online survey. In this, we follow Ito (2014), who also used written stimuli; this allowed for a much larger number of participants and more stimuli per participant (see Kawahara 2013 on the use of written stimuli in phonology experiments). The nonce word task was preceded by an identical task rating the acceptability of palatalized forms of real words, some of which were unambiguously acceptable or unacceptable, in order to contextualize the task for the participants. Within each task, the words were presented in a different, random order for each participant.

For each item, participants were presented with a base word along with its suffixed counterpart in the palatalized form and were asked to rate the goodness of the palatalized word on a scale from 1 (worst) to 5 (best).[5] The participants were given examples of real items likely to be rated 1 and 5 in the instructions by clicking on the corresponding button on the screen. The base form was presented with an adjective or preposition capturing the meaning of the suffix. Taking the

[4] The relative frequencies of consonants were extracted from Jakopin (2005)—see Section 5 for further details. Frequent diphone clusters were included as potential candidates for C_{INIT} during random generation, resulting in some CCVCVC words. Several segments were excluded during nonce word generation: (i) velar consonants, which will be explored in Experiment 2, (ii) anterior coronals, because of complications with consonant harmony processes (Jurgec 2011:§8.5.2), and (iii) segments occurring primarily in loanwords, such as [f].

[5] This scale was used because it is familiar to the speakers. The same scale is used for marks in Slovenian primary and secondary schools.

example of the nonword *petoka* and the diminutive suffix -*itsa*, participants were asked to rate the acceptability of a 'small petoka' being called *petotʃitsa* (cf. the non-palatalized version *petokitsa*). Sample survey items with and without postalveolars in the stem are given in Figure 1.

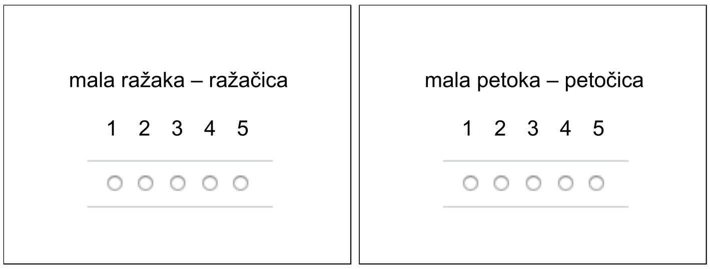

Fig. 1: Sample survey items with postalveolar present (*ɾaʒaka*) or absent (*petoka*) in the base form. Participants were asked to rate the acceptability of each suffixed nonce word in its palatalized form (*ɾaʒatʃitsa* and *petotʃitsa*). Words in the example, as in the actual survey, are presented in Slovenian orthography. Mala stands for 'small' and corresponds to the meaning of the suffix -*itsa* in this case.

The survey took approximately 20 minutes.

3.2 Results

Our analysis was designed to test how well several factors predicted the acceptability of palatalized forms, as quantified by goodness ratings on a scale of 1 to 5.[6] We analyzed participants' ratings with mixed-effects linear regression models, using the `lme4` package in `R` (Bates et al. 2015). Aggregated results showing mean ratings for each form, for both Experiment 1 and Experiment 2, are available in the supplementary material associated with this article.

The primary predictor of interest, BlockerPosition, was used to test our main hypothesis that a postalveolar segment in the base form would result in lower ratings for palatalized forms, as well as the possibility that base-medial postalveolar segments, being closer to the locus of palatalization, would exert a stronger blocking effect than base-initial segments. BlockerPosition divided the types of base words into three categories: those with no postalveolar in the base (Absent, e.g. *mebuk*), those with a postalveolar in initial position (C_{Init}, e.g. ***tʃ****unok*), and those with a postalveolar in medial position (C_{Med}, e.g. *tri****tʃ****ak*). We set up our model to incorporate two separate statistical comparisons for this predictor: first, a categorical effect of presence vs. absence of a blocking segment, regardless of position (i.e. Absent vs. $C_{\text{Init}}/C_{\text{Med}}$), and second, whether the position (C_{Init} vs. C_{Med}) further influenced acceptability. Two additional predictors allowed us to examine whether the choice of base-final target C_{Fin} {*k, g, x*} and Suffix {-*itsa*, -*itʃ*, -*ək*, -*ən*} influenced goodness ratings for palatalized words.[7]

[6] These values were converted to a continuous scale for the purposes of analysis. It should be noted that the 5-point Likert scale used here is not strictly continuous; i.e. not all possible (continuous) values are available to participants, and equidistance between each scale point cannot be assumed. Norman (2010) provides review and discussion of the relevant issues, concluding that parametric statistics (such as those used in the current work) are sufficiently accurate and robust to be used with Likert scale data.

[7] Coding schemes: the dual comparison for BlockerPosition was implemented using Helmert Coding because it allows for two comparisons: (i) Blocker Absence vs. Presence (with C_{Init} and C_{Med} collapsed), and (ii) Blocker Position (C_{Init} vs. C_{Med}). Suffix and C_{Fin} were simple-coded, with reference levels of *g* for C_{Fin} and -*ək* for Suffix.

Factor	β-coefficient	t-value	p	
Main effects				
Intercept (mean rating)	3.332	20.059	$< .001$	***
BlockerPosition Absent (vs. Present)	0.294	6.026	$< .001$	***
BlockerPosition C_{Init} (vs. C_{Med})	0.213	4.897	$< .001$	***
C_{Fin} *k* (vs. *g*)	0.198	4.495	$< .001$	***
Suffix *-itʃ* (vs. *-ək*)	−0.291	−3.471	$< .001$	***
Suffix *-itsa* (vs. *-ək*)	−0.140	−1.855	.068	.
Interactions				
BlockerPosition (Pres/Abs) : Suffix *-itsa*	0.208	3.399	$< .001$	***
C_{Fin} *k* : Suffix *-ən*	−0.153	−1.942	.055	.
C_{Fin} *x* : Suffix *-itʃ*	−0.134	−1.692	.094	.
C_{Fin} *k* : Suffix *-itʃ*	−0.235	−2.966	.004	**
C_{Fin} *x* : Suffix *-itsa*	0.222	2.811	.006	**

Table 4: Statistical results from a mixed-effects linear regression model with variables of BlockerPosition, C_{Fin}, and Suffix predicting participants' goodness ratings. Significant results ($p < .05$) and trends ($p < .1$) are reported here; full results, and the formula used for the model, can be found in the Appendix, Table 13). The formula used was: `rating ~ BlockerPosition * C.Fin * Suffix + (BlockerPosition + C.Fin + Suffix | Participant) + (1 | Item)`

Interactions between the three predictor variables (BlockerPosition, C_{Fin}, and Suffix) were included in order to test whether the effect of the predictors differed depending on the status of the other variables; for example, this allowed us to examine the possibility that the presence/absence of a postalveolar only affected acceptability in the context of certain suffixes. In order to account for participant and item-based variability, we included random intercepts for both of these, with the slopes for each fixed factor allowed to vary by participant; in other words, the model took into account the fact that different participants (and items) can show different patterns of effects. We used an alpha-level of .05 as our criterion for significance; p-values were computed using the `lmerTest` package in `R` (Kuznetsova et al. 2016).

Statistical results from the model predicting acceptability from BlockerPosition, Suffix, and C_{Fin} are reported in Table 4. Only significant results ($p < .05$) and statistical trends ($p < .1$) are reported here; the full model results and formula are given in the Appendix (Table 13). Beta-coefficients in Table 4 show the predicted increase (for positive) or decrease (for negative) in acceptability rating when each parameter is manipulated (holding all else constant). We elaborate on the interpretation of the coefficients below.

Figure 2 shows the results for our primary factor of interest, BlockerPosition. The graphs show a consistent, predicted pattern: participants rated palatalized forms with a stem-internal postalveolar as less acceptable than those without. Furthermore, when present, postalveolars in medial position (i.e., closer to the locus of palatalization) elicited lower ratings than those in initial position. The difference between presence and absence of blocker was significant, with words containing blockers eliciting on average a lower score (0.294 points, as shown by the beta-coefficient corresponding to BlockerPosition Absent (vs. Present) in Table 4). Along with this overall effect, the difference between initial and medial positions was also statistically significant (with a difference of 0.213 points). On average, participants gave ratings of 3.5 for nonce words not containing a blocker, 3.3 for nonce words with a postalveolar C_{Init}, and 3.1 for nonce words with a postalveolar C_{Med}.

Details on coding systems for categorical variables can be found at the UCLA Institute for Digital Research and Education: `http://www.ats.ucla.edu/stat/r/library/contrast_coding.htm`.

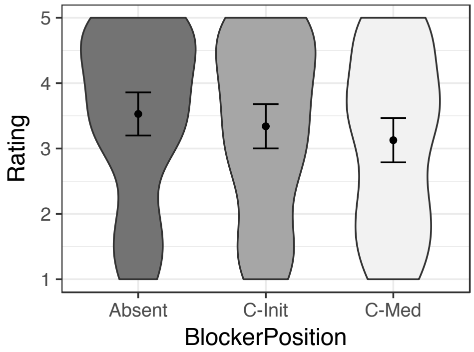

Fig. 2: Effect of BlockerPosition: average acceptability rating when there is no postalveolar in the stem (absent) as compared with a postalveolar in initial and medial position. Graphs (here and below) show the distribution of by-participant average ratings; errorbars show two standard errors above and below the means of these distributions. The violin plots present the rating distribution as a smoothed density shape.

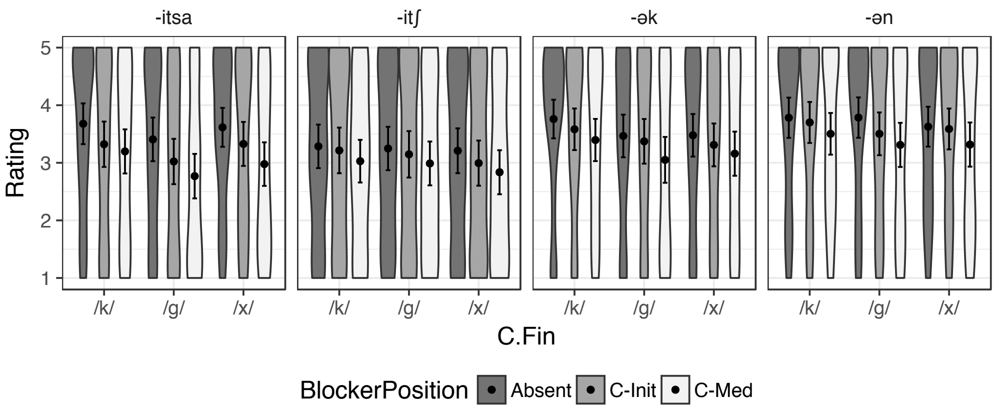

Fig. 3: Graphs showing effect of BlockerPosition, broken down by C_{FIN} and Suffix.

To give a more complete picture of how the main effect of BlockerPosition holds across different suffixes and target segments, participants' ratings broken down by Suffix and C_{FIN} are given in Figure 3.Overall, we can see a consistent pattern of BlockerPosition across all four suffixes: ratings are highest in words where a postalveolar is absent in the stem, followed by those in which it is in medial position (C_{MED}), with the lowest ratings for those with the postalveolar in final position (C_{FIN}). In contrast, the relative acceptability of nonwords with different final consonants (/k/, /g/, /x/) differs across suffixes.

The statistical results show a significant interaction of BlockerPosition and Suffix: while always in the same direction, the effect of BlockerPosition is even stronger for the suffix *-itsa*, as shown by the positive beta-coefficient corresponding to this interaction. By adding this coefficient (0.208) to the main effect of Blocker Presence/Absence discussed above (0.294), we can see that there is on average a half-point difference (0.502) in acceptability between base forms with or without a postalveolar for nonce words with this suffix. This reflects Jurgec's (2016) corpus data reviewed in Table 2: stems with postalveolars have lower palatalization rates than stems without them.

Several ancillary effects were also observed. There was a significant effect of C_{FIN}, with items ending in voiceless velar stop *k* receiving overall higher ratings, as well as a significant effect of SUFFIX, with items suffixed with *-itʃ* eliciting lower ratings than the other suffixes. This result differs from the corpus pattern, where *-itʃ* has 11.2% higher palatalization rates than *-ək*. The experimental finding does not reflect the cross-linguistic preferences in which high and front vowels tend to trigger palatalization more often, and at higher rates, than other vowels (Bateman 2007; Kochetov 2011). Based on phonological factors alone, we would expect *-itʃ* to have higher palatalization rates than *-ək* and *-ən* which do not contain a high front vowel. However, palatalization in Slovenian is morphologically conditioned: not all front vowel suffixes are palatalizing and some suffixes are consonant-initial (Jurgec 2016; see Section 2 of this paper). Moreover, Zymet (2018) has shown that the likelihood of a particular Slovenian suffix to palatalize is at least partially lexical. There is an alternative explanation why *-itʃ* has a statistically significant lower rating when compared to other suffixes: only this suffix itself contains a postalveolar, which could block palatalization if co-occurrence restrictions in Slovenian applied generally. This is further supported by the fact that there are significant interactions between C_{FIN} and SUFFIX: the ratings were lower for the combination of C_{FIN} *k* and suffix *-itʃ*. Since *k* palatalizes to *tʃ*, this results in a *tʃitʃ* sequence which is itself potentially dispreferred; this possibility is explored further in Section 3.3. In contrast, the ratings were *higher* for the combination of C_{FIN} x and suffix *-itsa*, for which we can offer no explanation.[8] No interactions or main effects other than those reported were significant ($p > .1$).

Overall, our prediction was supported: participants indicated reduced acceptability of palatalized forms when a postalveolar was present in the stem, mirroring corpus patterns. Locality also appears to play a role: base-medial postalveolars were in turn less acceptable than base-initial postalveolars, suggesting that the co-occurrence restrictions are stronger when the blocker is closer to the locus of palatalization. These tendencies reflect cross-linguistic regularities (Section 1) as well as patterns found in the corpus (Section 2).

3.3 Follow-up: Total identity effects

The results above are consistent with our prediction that postalveolars in the base reduce the well-formedness of palatalized forms, due to a postalveolar co-occurence restriction. However, an alternative explanation is that the effect could simply be driven by avoidance of identical segments. Derived palatalization in Slovenian can result in the co-occurrence of two identical segments; for example, the base *mleʒag*, suffixed with *-ən*, would result in [mleʒaʒən] in its palatalized form, and the two identical consonants could lead to a preference for the nonpalatalized form [mleʒagən]. Cross-linguistically, identity effects are well attested, but there are two different patterns. In Chol, identical segments are exempt from laryngeal co-occurrence restrictions applying to non-adjacent segments (Gallagher and Coon 2009). The opposite pattern is attested in Japanese, where nonce compounds show weaker rendaku voicing effects when the

[8] One hypothesis may have to do with the fact that [x] is often perceived as a loanword segment, particularly in the initial position (Jurgec 2007:121). As such, [x] is a lexically marked segment in Slovenian, which goes together with the lack of palatalization, also more often observed in loanwords. Speakers may prefer palatalization as a strategy to avoid both marked structures occurring in the same word; this is an instance of a gang-effect in Harmonic Grammar (Pater 2009). Fukazawa et al. (2015) show a similar pattern in Japanese: geminates appearing in loanwords devoice at higher rates when the root contains a [p], which is itself also limited to loanwords. A separate study is needed to explore this effect in Slovenian.

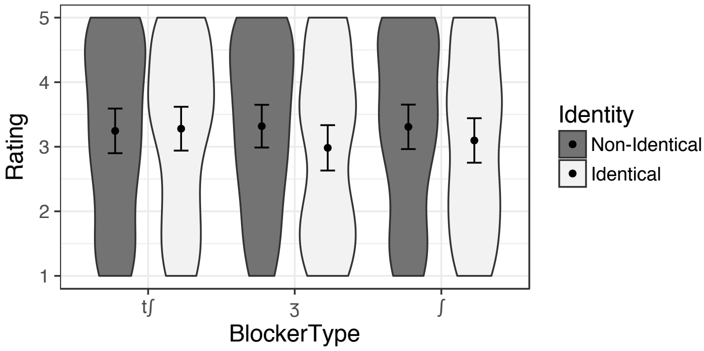

Fig. 4: Ratings broken down by BlockerType and by whether the resulting palatalized form would result in the target segment being identical to the postalveolar in the stem. Dark grey violin plots present ratings involving non-identical postalveolars (e.g. *mletʃag* ∼ *mletʃaʒən*), whereas the light grey plots present forms with identical postalveolars (e.g. *mleʒag* ∼ *mleʒaʒən*).

rendaku would result in two identical obstruents (Kawahara and Sano 2014a,b). We saw suggestive evidence of a total identity effect in our current data in the interaction of C_{Fin} and Suffix above; in this section we explore this possibility more directly.

If total identity co-occurrence restrictions are the main cause of the blocking effect, we expect to find the following patterns. First, in cases where there is no potential identity violation, we do not expect to find any blocking effect; in other words, if we remove the subset of forms that would result in an identity violation when palatalized, our main effect of BlockerPosition should disappear. Second, we should see overall lower acceptability ratings for those forms which, when palatalized, result in total identity violations. We address these two predictions below.

In order to test the question of whether the main effect of BlockerPosition still exists independently of total identity effects, we removed all forms in which the target segment, in its palatalized form, would be identical to the postalveolar blocker (e.g. *mleʒaʒən*). 1416 tokens were omitted, for a remaining 7080 tokens to be analyzed. We ran the same model described above (with a dependent variable of participants' acceptability ratings and predictor variables of BlockerPosition, C_{Fin}, and Suffix) on this subset of data. This model shows the same significant effects as the original model (see Table 14 in the Appendix for model results). Overall, then, our main effect holds, even in the absence of forms showing identical consecutive segments, suggesting that total identity restrictions are not driving the blocking effects.

Even if total identity avoidance is not the *sole* driver of the blocking pattern, as shown above, it may still influence ratings. Figure 4 shows participants' average ratings, broken down by whether or not palatalization of the target would result in an identical segment to the postalveolar in the base. There is not a consistent effect for all segments, but those effects that are seen are consistent with the expected direction of identity effects. Specifically, it appears that identity violations may elicit lower ratings for BlockerType *ʃ* (with C_{Fin} *x*, which palatalizes to *ʃ*) and for BlockerType *ʒ* (C_{Fin} *g*, which palatalizes to *ʒ*), but not for the affricate *tʃ* (with C_{Fin} *k*, which palatalizes to *tʃ*).

To test these effects statistically, we built another mixed-effects regression model using the subset of data that included a blocking segment (since those items without blocking segment are not specified for BlockerType). Our response variable was again the participants' rating on a scale from 1 to 5, with predictor variables of BlockerType {*tʃ*, *ʒ*, *ʃ*} (reference level *tʃ*) and TotalIdentity violation (Yes/No). We also included the variable of BlockerPosition (C_{Init}

Factor	β-coefficient	t-value	p	
Intercept (mean rating)	3.206	18.796	< .001	***
BlockerPosition C_{Init} (vs. C_{Med})	−0.233	−3.630	0.001	**
BlockerType ʒ (vs. ʧ)	−0.112	−1.538	0.129	
BlockerType ʃ (vs. ʧ)	−0.060	−0.836	0.406	
TotIdent	−0.171	65.816	0.006	**
BlockerPosition : BlockerType ʒ	0.107	0.749	0.457	
BlockerPosition : BlockerType ʃ	−0.043	−0.304	0.762	
BlockerPosition : TotIdent	−0.121	−1.041	0.302	
BlockerType ʒ : TotIdent	−0.370	−2.587	0.012	*
BlockerType ʃ : TotIdent	−0.245	−1.712	0.092	.
BlockerPosition : BlockerType ʒ : TotIdent	−0.129	−0.452	0.653	
BlockerPosition : BlockerType ʃ : TotIdent	−0.184	−0.645	0.521	

Table 5: Statistical results: A Total Identity violation (TotIdent) refers to situations in which palatalization would result in the target being identical to the postalveolar blocker. The formula used was: `rating ~ BlockerPosition * BlockerType * TotIdent + (BlockerPosition + BlockerType + TotIdent | Participant) + (1 | Item)`.

or C_{Med}; the No Blocker items were excluded from this model) in order to see whether any effect of identity violations held equally across positions. The coding and random effects structure for the model were identical to those of the previous model, except that BlockerPosition, which in this model had only two levels compared to three in the original model, was simple-coded instead of Helmert-coded.

Results from the full model are reported in Table 5. Along with the overall effect, found in the previous model, that locality of the BlockerPosition affects ratings (with medial eliciting lower ratings than initial), we also found that the total identity effect was significant, with those forms including a total identity violation in their palatalized form eliciting lower ratings than those that did not. As seen in the graphs, this effect is not consistent across all segments, but interacts with BlockerType; specifically, the total identity effect is significantly greater when the postalveolar segment in the base is ʒ, and marginally greater when the segment is ʃ, as compared to base-internal ʧ, where there is no apparent effect (the mean difference in ratings between non-identical and identical segments was 0.34 for ʒ, 0.21 for ʃ, and −0.03 for ʧ). In short, while total identity appears to be a relevant factor, it cannot explain all the patterns found in the experimental results.

3.4 Interim summary

Experiment 1 confirms that Slovenian postalveolar co-occurrence restrictions observed in a previous corpus study (Jurgec 2016) are extended to nonce words. We find that derived palatalized nonce words with a postalveolar anywhere in the root results in significantly lower acceptability ratings when compared to roots without postalveolars. While small in magnitude, with less than a half-point difference between forms with and without a postalveolar "blocker," this effect is present with all suffixes.

We also found two effects that were not reported in the corpus study. The first is a proximity effect: root-medial postalveolars resulted in lower ratings when compared to root-initial postalveolars (which are further from the target of palatalization). Our reexamination of the corpus (Table 2) confirmed a similar tendency, even though the number of stems with postalveolars is small. Similar results have been reported by Ito (2014): laryngeal restrictions are stronger for consonants across a vowel than at larger distances. The second effect is total identity: derived words with identical postalveolars were rated lower than words with non-identical postalveolars. This, too, matches the cross-linguistic tendencies in laryngeal co-occurrence restrictions as well as more generally in dissimilation (Vance 1991; Pierrehumbert 1993; Frisch et al. 2004), and leads us to ask a further question: is the Slovenian OCP effect reported above a case of a more general co-occurrence restriction not specific to derived forms? This will be addressed in Experiment 2.

4 Experiment 2: Postalveolar co-occurrence restrictions in derived and non-derived words

In Experiment 1, speakers showed lower goodness ratings for palatalized derived forms of non-words when the stem included a postalveolar, providing evidence that the apparent blocking effect seen in the lexicon (Jurgec 2016) forms a part of speakers' phonological knowledge. In a follow-up experiment, we probe the generality of this effect in two ways. First, we examine whether the effect is specific to derived forms, by asking participants to rate non-derived as well as derived forms. That is to say, is the postalveolar co-occurrence restriction properly characterized as a long-distance morphological derived environment effect (as Jurgec 2016 concludes; see Jurgec and Bjorkman 2018 for a recent overview of such patterns elsewhere in Slovenian and cross-linguistically), or it is fully general, applying to derived and non-derived words alike? Second, we explore the possibility that the co-occurrence applies equally to all places of articulation, as opposed to being specific to postalveolars.

Along with these additional theoretical questions, we used a slightly different task for the derived-word task in Experiment 2: instead of speakers rating the goodness of only a palatalized form, we asked speakers to provide ratings for both palatalized and non-palatalized versions of derived forms. This modified design allowed for a more robust test of the productivity of palatalization itself. In Experiment 1, participants were only presented with palatalized derived forms, so it was not possible to compare the goodness of palatalized vs. nonpalatalized forms. This obscures a key question: is palatalization itself a productive process?

Native speakers' intuitions suggest that palatalization may no be longer productive in Slovenian. For instance, most 20th century loanwords do not palatalize (e.g. [mali**g**-ən] 'malignant', [fizi**k**-itsa] 'physics-DIMINUTIVE', [lus**k**-ina] 'animal scale'; see Jurgec 2007:106–109). In support of this claim, Mišmaš (2011) conducted a pilot production study inspired by Pierrehumbert (2009) who tested productivity of the English $k{\sim}s$ alternation (*electric* ∼ *electricity*). Mišmaš (2011) examined the productivity of Slovenian palatalization in three tasks. First, seven participants were asked to derive seven real stems by adding specific palatalizing suffixes. The derived words in these stimuli were not previously attested (i.e. their frequency of the derived forms in the corpus was 0). Second, the participants were asked to do derive 14 mono- and disyllabic nonce stems. The palatalization rate was 7% for both real and nonce words; on average each participant palatalized one nonce word stem (no breakdown by speaker is provided). The third task was a backformation task involving two real and three nonce words, all showing postalveolars in the stem-final position (e.g. *fiʒitsa*, but using the orthography). While the backformation was accurate for real words, the participants uniformly failed to depalatalize nonce stimuli. Mišmaš (2011) concludes that palatalization is no longer productive. However, this design did not actually test participants' judgments of palatalized forms: even if participants did not spontaneously use palatalization in derived forms, this does not necessarily mean that the forms are unacceptable. Corpus statistics discussed in Section 2 reveal that palatalization is variable: its occurrence is conditioned by phonological and morphological factors, and even these are not deterministic,

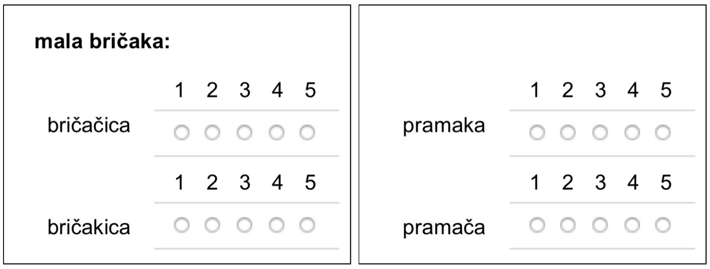

Fig. 5: Sample questions for the derived word (left) and non-derived word (right) tasks in Experiment 2. The left box shows two potential forms for 'small *britʃaka*': *britʃatʃitsa* or *britʃakitsa*. The right box shows two potential novel non-derived word forms: *pramaka* and *pramatʃa*. As in Experiment 1, all stimuli were orthographic.

with some words appearing in both palatalized and non-palatalized forms. Therefore, the finding that speakers did not show online palatalization of nonce words does not necessarily mean that the palatalized forms are ungrammatical; for example, it could be the case that both palatalized and nonpalatalized forms are acceptable, but nonpalatalized forms are dispreferred. By modifying the experimental design we can probe this question: if palatalization is indeed not productive, or highly dispreferred, we would expect to see much lower ratings for palatalized vs. non-palatalized forms.

4.1 Methods

Procedure: The procedure was similar to that in Experiment 1, with participants rating the goodness of Slovenian nonce words on a scale of 1 (unacceptable) to 5 (perfectly acceptable) via an online survey. In this experiment, there were two sections, one in which participants rated novel derived words (similar to the task in Experiment 1), and one where they rated novel underived words. The non-derived word task was presented first, followed by the derived word task to avoid any effect of derived words on non-derived words. In what follows, however, we present the two tasks in the opposite order to make a clearer parallel with Experiment 1.

Sample questions for each of the two tasks are given in Figure 5. The derived word task (left panel of Figure 5) was identical to Experiment 1, but instead of rating only the palatalized form, participants were given both the palatalized and faithful form and asked to give a rating for both. Both forms were presented as part of the same question, but no explicit instructions were given to compare the two: participants could give both words the same rating if they wished. In the non-derived word task (right panel of Figure 5), participants were presented with two nonce words, which were identical except for the presence vs. absence of a postalveolar as the final consonant, and asked to rate them based on how acceptable each would be as a new word of Slovenian. Recall that all participants completed the non-derived word task first, followed by the derived word task.

Materials: The forms used for the derived task in Experiment 2 were designed to be as similar as possible to those in Experiment 1. Base forms again had the shape $C_{\text{INIT}}VC_{\text{MED}}VC_{\text{FIN}}$, followed by a suffix. The forms for the non-derived word task were of the same shape, but followed by the feminine nominative singular suffix *-a*, to make it more likely for the speakers to perceive them as native words (Jurgec 2007); except for female names, over 99% of recent loanwords in Slovenian are masculine, ending on any other segment. Inflectional suffixes like *-a* do not trigger palatalization.

For both tasks, our main question of interest was the effect of postalveolars in medial and final positions, C_{MED} and C_{FIN}, since postalveolars in adjacent syllables showed the strongest effect above. Therefore, there was no predictor variable corresponding to BLOCKERPOSITION of Experiment 1. We also did not include the specific C_{FIN} segment as a factor, since the blocking effect was not shown to differ for target *k* and *x* in Experiment 1.

C_{MED} was either a postalveolar (ʧ, ʃ), a velar (k), or another consonant (m, b, ɾ) (the reasoning for the singling out of /k/ as a category will be explained when discussing predictions below). The base-final (for derived words) or word-final (for non-derived words) consonant, C_{FIN}, was either a postalveolar (ʧ, ʃ) or a velar (k, x). Finally, for the derived task, we used the two suffixes that elicited the lowest (*-itsa*) and highest (*-ən*) overall ratings in Experiment 1.

Forms were generated as follows: for each C_{MED}, eight unique base forms were generated.[9] For the derived task, 4 of these were assigned to each of the two suffixes. Each of these forms was presented in pairs (as shown in Figure 5, with C_{FIN} as velar for one member of the pair, and C_{FIN} as postalveolar for the other. This resulted in a total of 192 stimuli: 6 C_{MED} × 8 forms (4 with *-itsa* and 4 with *-ən*) × 2 C_{FIN} × 2 tasks. All forms are given in the Appendix (Tables 11 and 12).

Participants: 50 native speakers of Slovenian participated in this experiment. Recruitment methods and inclusion criteria were identical to Experiment 1. Speakers ranged in age from 20 to 75 (mean 43), and came from the following dialect regions: 20 from the central dialects, 13 from the north-east, 12 from the south-west, and 5 unknown. The the vast majority of the participants in Experiment 2 did not participate in Experiment 1, which we can infer from the demographic and optional contact information provided by the participants. However, we cannot exclude the possibility that some of the participants were not the same individuals. Experiment 2 was conducted two years after Experiment 1. As in Experiment 1, the survey took approximately 20 minutes to complete.

4.2 Predictions

As in Experiment 1, we designed the analysis to test factors potentially influencing participants' goodness ratings using mixed-effects regression models. Our primary analysis included three factors. WORDTYPE indicates whether the word was part of the derived vs. non-derived word task. C_{MED} indicates the place of articulation of the medial consonant. Since our question is about place-related co-occurrence restrictions, we examine this factor in terms of three levels: postalveolar (ʧ, ʃ), velar (k), and other (b, m, ɾ). C_{FIN} indicates the place of articulation of the final consonant: postalveolar (ʧ, ʃ) or velar (k, x). For the derived forms, this corresponds to "faithful" or "palatalized" derivations. Throughout, we use Š to refer to the class of postalveolars and K to refer to the class of velars. Finally, as an ancillary analysis in the derived word task, we also examined the effect of SUFFIX.

In Experiment 1, we found that palatalization of C_{FIN} was less acceptable when there was a postalveolar C_{MED}. Although using a slightly different design, in which participants saw both palatalized and non-palatalized options for derived forms, we expected to replicate this effect, which would be shown by an interaction of C_{MED} and C_{FIN}: specifically, we predict lower ratings for C_{FIN} when C_{MED} is postalveolar than when it is not. We also examine whether the suffix-

[9] As in Experiment 1, consonants and vowels not specified here were randomly generated from a set of common segments of Slovenian, with the exception of the second vowel, which was always either /a/ or /o/, in order to avoid potential preference for palatalization in high or front vowels. In cases where random generation resulted in a real word of Slovenian, these forms were replaced. Native speakers were consulted to make sure that non-derived words were not perceived as morphologically complex.

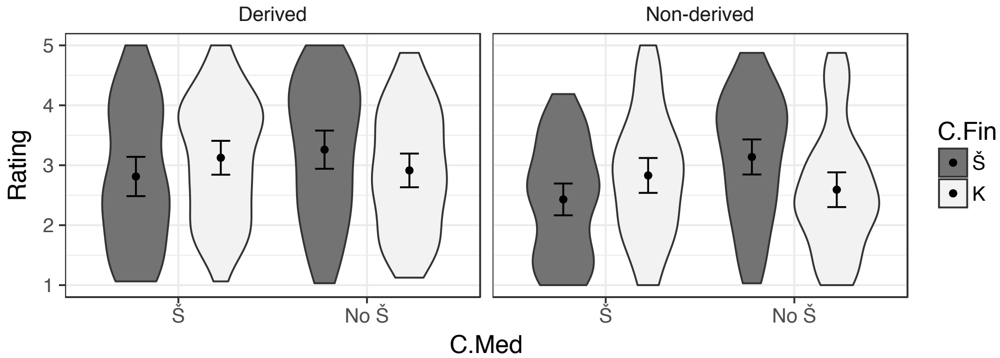

Fig. 6: Experiment 2: Goodness ratings for derived (left) and non-derived (right) words, broken down by presence of a postalveolar in medial (C_{MED}) or final (C_{FIN}) position.

specific effects found in Experiment 1, in which *-itsa* elicited a larger apparent blocking effect than *-ən*, is replicated in this design.

We now turn to the novel questions addressed in Experiment 2. First, the different task provided a more robust test of the productivity of palatalization in derived forms. If palatalization is not productive, as argued by Mišmaš (2011), we expect to see *overall* lower ratings for postalveolar C_{FIN} than for velar C_{FIN} (regardless of the status of C_{MED}), at least in the derived-word task.

Second, we can examine the generality of the effect reported above in Experiment 1. If the apparent co-occurrence restriction is specific to morphologically derived forms, we expect to see this effect only in the derived task, and not in the non-derived word task: this would appear as a three-way interaction between C_{MED}, C_{FIN}, and WordType, in which we would expect to see the aforementioned interaction between C_{MED} and C_{FIN} occurring only (or in greater magnitude) in derived, but not in non-derived, words. If, on the other hand, the effect can be ascribed to a general co-occurrence restriction with postalveolars, we do *not* expect to see a three-way interaction between C_{MED}, C_{FIN}, and WordType.

Finally, we probe the extent to which more general place-reated co-occurrence restrictions may contribute to and/or account for the effects found in Experiment 1. If there are general restrictions on identical place of articulation on adjacent consonants, we should see that the velar (i.e. nonpalatalized) C_{FIN} options are dispreferred relative to other, non-velar consonants when C_{MED} is also velar. In our statistical analysis, this would appear as an interaction between C_{MED} and C_{FIN}, as above, but this time focusing on the comparison between velar and other places of articulation, with lower ratings expected for velar C_{FIN} when C_{MED} is also velar.

4.3 Results

The graphs in this section show the density, mean, and two standard errors of by-participant means, broken down in several different ways. The first, Figure 6, is designed to provide a relatively direct comparison with the findings in Experiment 1, showing how participants' ratings for postalveolar vs. non-postalveolar C_{FIN} derived forms vary based on whether there is a preceding postalveolar (i.e. C_{MED}=Š), and comparing these response patterns in the derived vs. non-derived word tasks.

Looking first at the results of the derived word task (the left panel of Figure 6), we see that the apparent blocking effect found in Experiment 1 was replicated in this somewhat different task. The dark grey plots (where C_{FIN}=Š) show the sets of data analogous to that used in Experiment 1. In these forms, we see that goodness ratings are lower when there is a postalveolar earlier in the form (C_{MED}=Š, left side of the panel) than when there is not (right side).

In this experiment, we elicited participants' ratings of non-palatalized, as well as palatalized forms (light grey plots in Figure 6). This allows for a more robust test of the productivity of palatalization in derived forms. Interestingly, it appears that derived, non-palatalized forms (C_{FIN}=K) show *lower* goodness ratings than those with a palatalized final consonant but with no stem-internal postalveolar (C_{FIN}=Š and C_{MED}= no Š).[10] The fact that palatalized forms are rated equal to or better than nonpalatalized forms (in cases where there is no other postalveolar present) provides strong evidence that palatalization is in fact productive in these sorts of derived forms.[11]

Turning to the right panel of Figure 6, which shows the responses from the non-derived word task, we see the same overall pattern of results. Specifically, participants showed lower ratings for non-derived nonce words that had a postalveolar C_{FIN} when C_{MED} was postalveolar, and the opposite effect when no other postalveolar was present. The parallel pattern across word types suggests that the apparent blocking effect found in Experiment 1 is not specific to derived environments.

Figure 7 shows a more detailed view of the C_{MED}-C_{FIN} combinations, collapsed over both WordTypes, and sorted by C_{MED} place of articulation (postalveolar, velar, and "other"). The first panel shows what we have already seen: that postalveolar C_{FIN} is dispreferred when C_{MED} is postalveolar. The second two panels, which are broken down into "velar" or "other" (/m, b, ɾ/) C_{MED}, both show the opposite pattern: postalveolar C_{FIN} is actually *preferred* when C_{MED} is not postalveolar.

Let us now turn to inferential statistics. Our primary statistical test examined the effect of WordType (derived vs. *non-derived*), C_{MED} (postalveolar vs. velar vs. *other*), and C_{FIN} (postalveolar vs. *velar*) on participants' goodness ratings. All categorical factors were simple-coded, and levels in italics represent the reference level for each factor, such that the coefficients in the models below represent the average difference in rating compared to the reference level. The full random effects structure motivated by the design (random by-participant intercepts and slopes for C_{MED}, C_{FIN}, WordType, and their interactions, and random by-item intercept and slope for C_{FIN}) was included.

Results are given in Table 6. We focus our discussion of the results around our primary questions brought up above. First, we wanted to confirm that the apparent "blocking" effect found in Experiment 1 was again present in this somewhat different task. The significant interaction of C_{FIN} and C_{MED} shows that this effect was replicated in Experiment 2: specifically, a postalveolar C_{FIN} elicited lower ratings when C_{MED} was also postalveolar, relative to other consonants (i.e.

[10] This overall preference for palatalized forms differs by suffix, as will be discussed below; however, the co-occurrence restriction, our factor of interest, holds equally across the two suffixes. In order to be able to do a direct statistical comparison of derived and non-derived words, which do not contain different suffixes, we collapse the two suffixes together for our primary statistical analysis.

[11] The results also indicate that non-derived forms without postalveolars were judged lower than forms with a single postalveolar. Because the non-derived word task was completed before the derived task, this cannot be attributable to an extension of a generalization in derived words to non-derived words. There appears to be an independent preference for root-final postalveolars over velars. This, however, may be related to the fact that velars are less frequent than postalveolars in root-final feminine nouns. For instance, among nouns ending in *ˈaCa* in Toporišič (2001), postalveolars (e.g. [paˈlatʃa]) are 2.67 times more frequent than velars (e.g. [naˈpaka]).

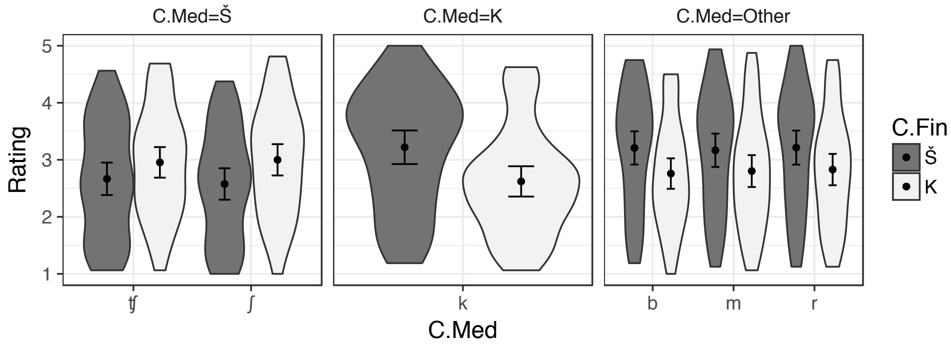

Fig. 7: Experiment 2: Goodness ratings at all combinations of C_{Med} and C_{Fin} place of articulation, collapsed over derived and non-derived wordtypes.

Factor	β-coefficient	t-value	p	
Intercept (mean rating)	2.090	−0.103	0.918	
C_{Med}=Š (vs. Other)	−0.197	−4.904	< 0.001	***
C_{Med}=K (vs. Other)	−0.076	−2.313	0.023	*
C_{Fin}=Š (vs. K)	0.214	1.736	0.088	.
WordType Derived (vs. Non-derived)	0.264	3.105	0.003	**
C_{Med}=Š : C_{Fin}=Š	−0.756	−5.875	< 0.001	***
C_{Med}=K : C_{Fin}=Š	0.199	1.562	0.122	
C_{Med}=Š : WordType	0.115	1.994	0.050	.
C_{Med}=K : WordType	0.005	0.069	0.945	
C_{Fin}=Š : WordType	−0.161	−1.278	0.204	
C_{Med}=Š : C_{Fin}=Š : WordType	0.189	0.871	0.386	
C_{Med}=K : C_{Fin}=Š : WordType	−0.366	−1.495	0.138	

Table 6: Statistical results from a mixed-effects linear regression model with variables of C_{Med}, C_{Fin}, and WordType predicting participants' goodness ratings. The formula used was: `rating ~ C.Med * C.Fin * WordType + (C.Med + C.Fin + WordType | Participant) + (C.Fin | Item)`.

/m, b, ɾ/, the reference level of C_{Med}, as shown by the negative coefficient corresponding to the interaction.[12]

Turning to the novel questions of Experiment 2, we examine whether this effect holds in both derived and non-derived words, which would be indicated by a significant three-way interaction between C_{Med}=Š, C_{Fin}, and WordType. The fact that this three-way interaction was not significant ($p > 0.1$) indicates that there is no evidence for a task-related difference; if this is the case, the apparent blocking effect is general, applying to both derived and non-derived forms. This is shown in Figure 6 above by the fact that there is a dispreference for forms with a postalveolar C_{Fin} in cases where C_{Med} is a postalveolar (mean rating of 2.62 when C_{Fin} is postalveolar vs. 2.98 when it is not), but a *preference* for postalveolar C_{Fin} when there is not (mean rating of 3.20 when C_{Fin} is postalveolar vs. 2.75 when it is not).

[12] Given the difference in model structure due to the slightly different task, in the Experiment 2 statistical results, a negative coefficient corresponds to a larger co-occurrence restriction, whereas in Experiment 1, a *positive* coefficient corresponded to a larger co-occurrence restriction.

There was, however, a significant main effect of WordType, indicating that there may be an *overall* effect of WordType on ratings, with overall higher ratings in derived (mean rating 3.05) than non-derived (mean rating 2.79) words. Given that the derived and non-derived word tasks asked qualitatively different questions, task-related differences may have contributed to this discrepancy. The important takeaway is that the magnitude of the *interaction* of C_{Med} and C_{Fin}, analogous to the blocking effect found in Experiment 1, did not differ between derived and non-derived words, suggesting that the blocking effect is not specific to derived forms.

In order to test whether there is an even more general restriction in Slovenian, in which any consonants with the same place of articulation occurring across a vowel are dispreferred, we examine whether multiple *velar* consonants show lower ratings, as multiple postalveolar consonants do. If so, we would expect to see a significant interaction of C_{Fin} with C_{Med}=K, with lower ratings when both are velar. The fact that there is not a significant interaction ($p > 0.1$) suggests that there is no dispreference for velar (vs. postalveolar) above and beyond that for "other" (non-postalveolar, non-velar) C_{Med}. In other words, although there *is* a preference for postalveolar C_{Fin} when C_{Med} is velar, which may at first glance suggest a potential OCP effect, this same preference occurs in other (labial, /ɾ/) consonants as well. Therefore, the apparent dispreference for velar C_{Fin} after C_{Med} /k/ cannot be explained by a velar-velar OCP effect.

Apart from the overall difference in rating based on WordType, discussed above, there was one other significant effect: C_{Med}=K had overall slightly lower ratings (mean 2.92) than those containing "other" C_{Med} (/b, m, ɾ/) (mean 3.00). We do not have an interpretation for this effect, and leave it for future research.

4.4 Suffix-specific effects

In this experiment, we included two suffixes in the derived word task. Suffix could not be included as a predictor variable in the overall analysis above because it was not a relevant factor for the non-derived word task; however, we wanted to check whether the co-occurence restriction held across both suffixes. Furthermore, we wanted to check whether the finding of a slightly larger blocking effect found for *-itsa* than for the other suffixes from Experiment 1 was replicated here. We tested the effect of suffix (*-itsa* vs. *-ən*) in the derived words from Experiment 2 using a mixed-effect model with the same structure outlined above: goodness ratings were predicted based on C_{Med}, C_{Fin}, and Suffix. *-ən* was the reference level for Suffix. Results are shown in Table 7, and a graph of the response data broken down by suffix is shown in Figure 8.

If the co-occurence restriction applied differently to the different suffixes, we would expect a three-way interaction between C_{Fin}, C_{Med}, and Suffix. This interaction was not significant, indicating that the co-occurrence restriction applies equally across the two suffixes. That said, there *was* a significant *two-way* interaction of Suffix with C_{Fin}. This shows that the goodness of palatalized forms (i.e. those with a postalveolar C_{Fin}) differed overall by suffix. Given this interaction, the significant main effect for *-itsa* cannot be interpeted on its own. In a follow-up test, we found that *-itsa* has higher ratings than *-ən* when C_{Fin} is palatalized, but that *-itsa* has lower ratings than *-ən* when C_{Fin} is not palatalized. However, the crucial point is that the effect of a postalveolar "blocker" (i.e. C_{Med}), was the same across suffixes.

The patterns can be seen in Figure 8. For both suffixes, a stem-final postalveolar (left side of each panel) is dispreferred when there is a postalveolar elsewhere in the stem (dark grey forms) than when there is not (light grey forms), and the magnitude of this difference is similar across the two suffixes. The suffix-related difference is most easily seen when C_{Fin} is velar (right side of each panel): *-ən* has lower ratings than *-itsa*.

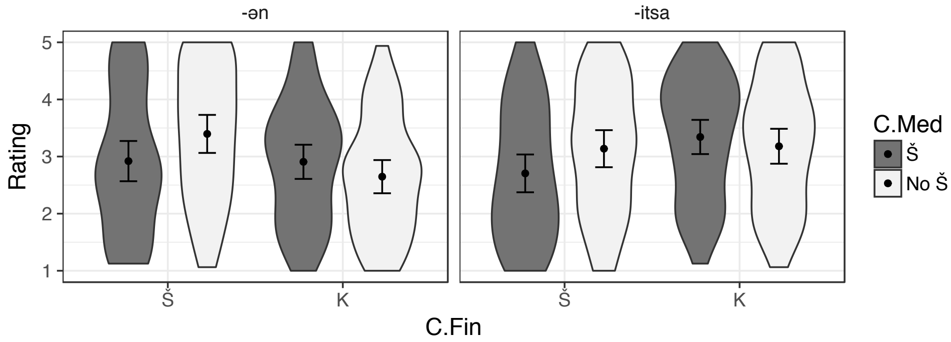

Fig. 8: Experiment 2: Derived task only, by suffix.

Factor	β-coefficient	t-value	p	
Intercept (mean rating)	3.113	0.848	0.401	
C_{Med}=Š (vs. Other)	−0.122	−3.641	0.001	**
C_{Fin}=Š (vs. K)	0.020	0.148	0.883	
Suffix -*itsa* (vs. -*ən*)	0.123	3.004	0.004	**
C_{Med}=Š: C_{Fin}=Š	−0.666	−7.115	< 0.001	***
C_{Med}=Š: Suffix	−0.027	−0.532	0.595	
C_{Fin}=Š : Suffix	−0.721	−7.703	< 0.001	***
C_{Med}=Š : C_{Fin}=Š : Suffix	0.141	0.755	0.454	

Table 7: Statistical results from a mixed-effects linear regression model with variables of C_{Med}, C_{Fin}, and Suffix in derived forms only, predicting participants' goodness ratings. The formula used was: `rating ~ C.Med * C.Fin * Suffix + (C.Med + C.Fin + Suffix | Participant) + (C.Fin | Item)`.

In sum, in Experiment 2, the suffixes elicited different goodness ratings based on the final consonant, which was not tested in Experiment 1, where all stem-final consonants were palatalized. However, crucially, there was no suffix-related difference in the magnitude of the co-occurrence restriction. The slightly larger restriction found for -*itsa* relative to other suffixes in Experiment 1 was not replicated here.[13]

4.5 Summary of Experiment 2 findings

Experiment 2 replicated the primary finding of Experiment 1, in which palatalized derived forms have lower acceptability ratings when there is another postalveolar consonant earlier in the word. Furthermore, the modified design of Experiment 2 allowed for a more robust test of acceptability of palatalization by collecting participants' ratings of both palatalized and nonpalatalized forms. Results demonstrated that palatalized forms are actually *preferred*, at least with some suffixes, when there is no other postalveolar in the word. Our findings are consistent with the corpus data (Jurgec 2016) in which the mean palatalization rate for stems without underlying postalveolars was 74.5%. However, this contradicts the patterns found in recent loanwords, which fail to palatalize. This mismatch between judgments and production resembles other cases re-

[13] However, it is important to note that in Experiment 1, this was relative to all suffixes, and a direct comparison with -*ən* was not included in that analysis.

cently identified in the literature. For instance, Zuraw (2000) showed that Tagalog participants prefer nasal substitution in prefixed words, but tend not to produce it in novel words. In more recent work, Smolek and Kapitsinski (2018) trained participants to palatalize labials, alveolars, and velars. While participants trained to palatalize alveolars or velars showed similar results in production and judgment tasks, participants trained to palatalize labials accepted palatalization, but failed to produce it.

Along with showing the productivity of palatalization and the blocking effect, the primary purpose of Experiment 2 was to probe the generality of the apparent co-occurence restriction by adding a non-derived word task to the modified derived word task. Participants showed the same pattern of ratings across the two word types, indicating that the effect is better conceptualized as a general co-occurence restriction on postalveolars, as opposed to a derived environment effect applying specifically to morphologically-driven palatalization.

Finally, although we were not able to test all places of articulation within the design of the current experiment, we were able to examine whether there was a similar co-occurrence restriction applying to velar segments. The fact that no such restriction was found suggests that the OCP effect in Slovenian is specific to postalveolars, although future work looking at other places of articulation is needed to test this claim more rigorously.

5 Discussion and conclusion

This work set out to examine whether an apparent long-distance blocking effect found in corpus data plays an active role in Slovenian speakers' synchronic grammar. Corpus patterns (discussed in Jurgec 2016) suggest that base forms that contain a postalveolar segment are less likely to show stem-final palatalization, a productive (but variable) process in Slovenian. The two experiments in the current work tested whether this pattern is a productive part of Slovenian speakers' phonology, and whether this pattern is specific to morphologically derived environments.

Our results support the interpretation that the corpus pattern reflects a synchronic phonological generalization. In the first experiment, participants rated palatalized forms as less acceptable when the stem contained a postalveolar than when there was no stem-internal postalveolar. There was some suffix- and target-conditioned variability in the size of the effect; however, the effect was present across all combinations of suffix and target. Although the effect was stronger when the stem-internal postalveolar was closer to the target of palatalization, indicating a proximity effect, the effect held across both positions. Follow-up analyses excluded the possibility that the effect is carried by identical segments (i.e. a total identity effect).

The second experiment provided an even stronger test of the productivity of derived palatalization by having participants rate both palatalized and non-palatalized forms of derived nonce words, and explored the generality of the phenomenon by eliciting ratings of non-derived forms. Results confirmed the consistency of preference for palatalization, and further showed that the apparent blocking effect seen in the previous corpus study (Jurgec 2016) is best described as a general co-occurrence restriction (OCP effect) rather than a specific derived environment effect. Furthermore, follow-up analyses showed that the co-occurrence restriction does not apply across the board for all places of articulation (and velars in particular), suggesting that this pattern targets postalveolars specifically.

The co-occurrence restrictions observed here for Slovenian share characteristics with consonant co-occurrence restrictions (OCP) found across many other languages. Laryngeal effects have received the most attention in recent literature. Examples include Korean co-occurrence restrictions on tense and aspirated consonants (Ito 2014), Japanese restrictions on voiced obstruents and geminates (Itô and Mester 1998; Kawahara and Sano 2013), and Quechua and

Bolivian Aymara restrictions on ejectives (Gallagher 2010a,b; Mackenzie 2013). Slovenian is a case of restrictions specific to place of articulation. This resembles OCP restrictions in Russian (Padgett 1992), English (Berkley 1994), Arabic (Pierrehumbert 1993), and Japanese (Kawahara et al. 2006). Like the Slovenian case, these languages exhibit a dispreference (but not categorical illformedness) for consonants with the same place of articulation within a word. Unlike Slovenian, however, in the languages reported in these previous studies, all places of articulation are affected in similar ways. In our study, we have shown that postalveolars exhibit a stronger OCP effect than velars, which differs from Russian where postalveolars and velars pattern together (Padgett 1992). The postaveolar-specific restriction is further supported by Jurgec and Sung (2019) who looked at the effect of OCP on the presence of [j] in inflected forms (e.g. [stiɾopoɾ] 'styrofoam-SG' ∼ [stiɾopoɾa/stiɾopoɾja] '-DUAL'). In this case, the presence of [j] in the onset of the stem-final syllable did not affect the acceptability rates of inflected nonce words, while stem length and root-final sonorant did. Thus, evidence suggests that the co-occurrence restrictions are specific to postalveolars and are not extended to palatals and velars.

The co-occurrence restrictions on postalveolars are fully general and can interact with palatalization, thus displaying the active alternation reported in Jurgec (2016). What is not attested in Slovenian, however, is a situation in which one of the postalveolars would be changed into another sound. Yet it is possible to make a parallel between Slovenian and other dissimilatory patterns that apply cross-vocalically or at longer distances. A review of the recent literature reveals that major place features are often dissimilated (Suzuki 1998:66–80,152–158; Alderete and Frisch 2007; Bye 2011). Bennett (2015:329–358) finds that labial dissimilation is particularly common, followed by coronal dissimilation; dorsal dissimilation is rare. There are no reported cases of minor place dissimilation, with the exception being anteriority of liquids. While Slovenian resembles these patterns, no other language has been reported to show dissimilation or OCP specific to postalveolars.

There is also a possibility that Slovenian postalveolar co-occurrence restrictions could be a part of larger set of sibilant-based restrictions. The sibilant inventory consists of three postalveolar sibilants *ʃ, ʒ, ʧ* and their alveolar counterparts *s, z, ʦ* (Table 1). Words with multiple non-adjacent sibilants are, however, subject to substantial inter- and intraspeaker variation. In particular, many Slovenian speakers exhibit optional regressive posterior sibilant harmony (Jurgec 2011:317−321): e.g. *sili-m* 'force-1SG' versus *ʃili-ʃ* -2SG'. Let us now look how sibilant harmony interacts with palatalization for these speakers only. It turns out that palatalization feeds sibilant harmony rather than blocks it. For instance, compare *sux* 'dry' with *ʃuʃ-ən* 'drought-ADJ', which shows root-final velar palatalization and regressive sibilant harmony. Paradoxically, co-occurrence of two postalveolars within a word is *preferred* as long as one of them is derived from an alveolar fricative—but appears to be avoided if one of them is derived from a velar, as shown in this paper. This pattern in particular resembles a mixed assimilatory-dissimilatory pattern predicted by Agreement-by-Correspondence (Bennett 2015) in which more similar sounds (sibilants) assimilate, but less similar sounds (postalveolars and velars) dissimilate, except that in this variety of Slovenian the generalization applies at the level of the underlying representations. This brings up a question for future research, which will also need to further probe and take into account variation across speakers and dialects. Jurgec (2011) reports a case in which coronal stops block harmony, but more recent production and perception studies reveal other speaker-specific patterns ranging from no blocking, blocking by labials, and blocking by all consonants (Bon 2017; Misic 2018), which is further complicated by a great deal of optionality. Furthermore, Standard Slovenian, which we used for our written stimuli, does not exhibit sibilant harmony, so cross-dialectal comparison will be crucial to understanding this phenomenon. Our current study shows that postalveolar co-occurrence restrictions apply to underlying postalveolars as well as the ones derived from velars, but we leave for future research what happens to underlying anterior sibilants.

We confirmed two further properties that connect the Slovenian data with other reported cases of consonant co-occurrence restrictions. First, Slovenian postalveolars exhibit total identity effects: the goodness ratings for identical consonants were significantly lower than ratings for dissimilar postalveolars. This resembles patterns observed in laryngeal co-occurrence restrictions in Korean, where participants produced fewer instances of compounds with identical tense consonants when compared to non-identical tense consonants (Ito 2014). In Japanese, similarly, identical obstruents had stronger co-occurrence restrictions when compared to non-identical obstruents (Kawahara and Sano 2014a,b, 2016). Second, Slovenian postalveolar co-occurrence restrictions are sensitive to proximity: forms with postalveolars across a vowel are rated lower than forms with postalveolars at larger distances. This, too resembles locality patterns observed in OCP and dissimilation. For instance, Korean shows lower tensification rates when the tense consonant blocker is across a vowel as opposed to when it is more distant (Ito 2014). A corpus study of Japanese geminate devoicing in loanwords (e.g. /baddo/ → [batto] 'bad') similarly found sensitivity to proximity (Kawahara and Sano 2013). Beyond consonants, Moreton and Amano (1999) have shown that modifying the initial consonant had an affect on the percept of final vowel length in Japanese. The Slovenian pattern thus confirms the tendencies found in co-occurrence restrictions in other languages, suggesting that Slovenian is rather typical from a cross-linguistic perspective.

The effects found in this work, although consistent across tasks and conditions, were very small in magnitude, with, for example, less than a half-point difference between forms with and without a postalveolar "blocker" in Experiment 1. This small effect is similar in magnitude to previous work; for example, Kawahara (2012) found that the difference between naturalness ratings (on a 5-point Likert scale) for Rendaku with and without an OCP violation was 0.7 points. One reason for this small size of effect might be due to the Likert scale rating task used here: previous work has demonstrated that forced-choice comparison tasks may be more powerful in revealing similar sorts of phonological effects (e.g. Daland et al. 2011; Kawahara 2015). The fact that consistent effects were nevertheless found with this arguably weaker method points to the robustness of the co-occurrence restriction in speakers' phonological grammars. Furthermore, the small effect sizes suggest that this effect is not a strong categorical restriction, but rather a more gradient pattern. This is not surprising given that other literature, cited above, also does not show categorical but rather gradient effect. This may be the reason that the pattern has been first identified only recently (Jurgec 2016) and was shown in the corpus most clearly when interacting with another variable pattern: palatalization. Our second experiment, however, shows that the co-occurrence restriction is fully general within Slovenian, found in both derived and non-derived words.

There was some indication of suffix-specific behavior in our results: in Experiment 1, *-itsa* elicited a larger co-occurrence restriction than the other suffixes, although the fact that this was not replicated in Experiment 2 points to the need to interpret this effect with caution. Nevertheless, the suggestion of differences indicates that more detailed investigation of the interaction between OCP and specific suffixes and/or morphological environments is warranted. In any case, the potential role of morpheme-specific effects in palatalization is a separate question that needs to be addressed independently. Jurgec (2016) already confirmed the existence of such differences. More recently, Zymet (2018) provides a detailed analysis of morphological and lexical factors in Slovenian palatalization. His main finding is that individual affixes and roots differ with respect to their palatalization tendencies (i.e. lexical propensities). His constraint-based mixed-effects logistic regression Maximum Entropy model found suffix-specific palatalization rates as well as local restrictions, but did not find that long-distance co-occurrence restrictions were as significant predictor. One reason why Zymet (2018) did not find significant postalveolar co-occurrence restrictions in his corpus may be that he did not exclude stems with underlying stem-final postalveolars (e.g. [ʧaʃ-a] 'cup' versus [ʧaʃ-itsa] 'small cup'). Co-occurrence restrictions never overtly turn postalveolars into velars (*[ʧax-itsa] 'small cup'). This may be responsible for Zymet's different results when compared to the current study as well as Jurgec (2016) where underlying postaolveolars were controlled for in palatalization environments. Moreover, the present study presented evidence that co-occurrence restrictions are robustly extended to nonce words in palatalization and non-palatalization environments, which suggests that postalveolar OCP is a part of speakers' phonological grammars independently of any lexical effects.

One question that arises from the results reported in this work is whether the OCP effect proposed here, which appears to be specific to postalveolars, is simply a reflection of patterns present in the lexicon. A rigorous test of this hypothesis is outside the scope of this paper. However, we briefly examined this prediction by comparing whether sequences of postalveolar-postalveolar consonants (separated by a vowel) are underattested relative to velar-velar consonants, which would provide a direct analog to our findings. To do this, we used observed over expected (O/E) frequencies based on Jakopin (2005), which is a list of 354,206 different Slovenian words in their dictionary forms (e.g. the nominative singular for most nouns and the infinitive for most verbs). We limited the search to the set of words which contain either two velar segments separated by one sound, or two postalveolar segments separated by one sound. We calculated these for a first segment of /k, ʧ, ʃ/, followed by the velar and postalveolar segments used in our experiments. All sequences with the same place of articulation (velar-velar and postalveolar-postalveolar) were under-attested, with O/E frequencies of less than 1. However, velar-velar sequences are *less* attested (O/E for k-k = 0.21 and k-x = 0.56) than postalveolar-postalveolar sequences (O/E for ʧ-ʧ = 0.67, ʧ-ʃ = 0.64, ʃ-ʃ = 0.59, ʃ-ʧ = 0.50). If participants' judgments are a simple reflection of lexical patterns, we would expect a stronger OCP effect for velars than postalveolars, but we did not find this in our experiments. Therefore, it does not appear that the pattern reported here can be fully accounted for by trends in the lexicon. One possibility is that the effect in underived words is extended from the morphological effect in derived words. A more nuanced analysis, incorporating multiple factors, is necessary to test this question in a satisfactory manner. Furthermore, a direct comparison with corpus patterns, which would require a larger set of experimental stimuli in order to account for other factors which guide lexical frequency, would be an important step toward gaining a better understanding of the relationship between the lexicon and speakers' phonology.

To summarize, we have shown that Slovenian exhibits co-occurrence restrictions in which multiple postalveolars (separated by a vowel) within a word are dispreferred. The generalization observed in palatalized derived forms in the lexicon (Jurgec 2016) was productively extended to both derived and non-derived nonce words. Further, the results indicate that the magnitude of the co-occurrence restriction is modulated both by proximity (with stronger effects when the two postalveolars are closer together) and by the identity of the two postalveolars (with stronger effects occurring when the two postalveolars are identical). These results add to a growing body of work showing long-distance co-occurrence restrictions across languages, and extend previous work by providing an example of a thus far unique combination of phonological restrictions.

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Appendix

Prompt	Palatalized form	BlockerPosition	BlockerType	C Fin	Suffix	Mean rating
mala čunoka	čunočica	initial	č [ʧ]	k	ica [-itsa]	3.271
mala šotoka	šotočica	initial	š [ʃ]	k	ica [-itsa]	3.373
mala žepoka	žepočica	initial	ž [ʒ]	k	ica [-itsa]	3.322
mala čovuga	čovužica	initial	č [ʧ]	g	ica [-itsa]	3.220
mala šedega	šedežica	initial	š [ʃ]	g	ica [-itsa]	3.051
mala žilega	žiležica	initial	ž [ʒ]	g	ica [-itsa]	2.797
mala čavaha	čavašica	initial	č [ʧ]	h [x]	ica [-itsa]	3.322
mala šumoha	šumošica	initial	š [ʃ]	h [x]	ica [-itsa]	3.373
mala žepaha	žepašica	initial	ž [ʒ]	h [x]	ica [-itsa]	3.288
mali čuruk	čuručič	initial	č [ʧ]	k	ič [-iʧ]	3.119
mali šenok	šenočič	initial	š [ʃ]	k	ič [-iʧ]	3.305
mali žoluk	žolučič	initial	ž [ʒ]	k	ič [-iʧ]	3.220
mali čelag	čelažič	initial	č [ʧ]	g	ič [-iʧ]	3.237
mali šidag	šidažič	initial	š [ʃ]	g	ič [-iʧ]	3.136
mali žuvug	žuvužič	initial	ž [ʒ]	g	ič [-iʧ]	3.068
mali čutoh	čutošič	initial	č [ʧ]	h [x]	ič [-iʧ]	3.034
mali šepeh	šepešič	initial	š [ʃ]	h [x]	ič [-iʧ]	3.000
mali žuvoh	žuvošič	initial	ž [ʒ]	h [x]	ič [-iʧ]	2.949
mali čibok	čiboček	initial	č [ʧ]	k	ek [-ək]	3.661
mali šolok	šoloček	initial	š [ʃ]	k	ek [-ək]	3.593
mali žeruk	žeruček	initial	ž [ʒ]	k	ek [-ək]	3.492
mali čureg	čurežek	initial	č [ʧ]	g	ek [-ək]	3.492
mali šunog	šunožek	initial	š [ʃ]	g	ek [-ək]	3.458
mali župog	župožek	initial	ž [ʒ]	g	ek [-ək]	3.169
mali čujah	čujašek	initial	č [ʧ]	h [x]	ek [-ək]	3.373
mali šeboh	šebošek	initial	š [ʃ]	h [x]	ek [-ək]	3.356
mali žuroh	žurošek	initial	ž [ʒ]	h [x]	ek [-ək]	3.203
iz čamuka	čamučen	initial	č [ʧ]	k	en [-ən]	3.593
iz šomaka	šomačen	initial	š [ʃ]	k	en [-ən]	3.763
iz žoloka	žoločen	initial	ž [ʒ]	k	en [-ən]	3.746
iz čilaga	čilažen	initial	č [ʧ]	g	en [-ən]	3.593
iz šolaga	šolažen	initial	š [ʃ]	g	en [-ən]	3.576
iz žajoga	žajožen	initial	ž [ʒ]	g	en [-ən]	3.339
iz čebaha	čebašen	initial	č [ʧ]	h [x]	en [-ən]	3.678
iz šeroha	šerošen	initial	š [ʃ]	h [x]	en [-ən]	3.458
iz žamoha	žamošen	initial	ž [ʒ]	h [x]	en [-ən]	3.627

Table 8: Materials used for Experiment 1 (initial-blocker words) and their mean ratings. Participants were given the prompt (nonce word base form) and its corresponding palatalized form, and asked to rate the acceptability of this form. Slovenian orthography is given for the wordforms; IPA for the blocking postalveolar segment, palatalization target, and suffix are given when they differ from the orthography.

Prompt	Palatalized form	BlockerPosition	BlockerType	C Fin	Suffix	Mean rating
mala tričaka	tričačica	medial	č [ʧ]	k	ica [-itsa]	3.203
mala tišaka	tišačica	medial	š [ʃ]	k	ica [-itsa]	3.169
mala ražaka	ražačica	medial	ž [ʒ]	k	ica [-itsa]	3.220
mala močaga	močažica	medial	č [ʧ]	g	ica [-itsa]	2.763
mala došuga	došužica	medial	š [ʃ]	g	ica [-itsa]	2.949
mala mližoga	mližožica	medial	ž [ʒ]	g	ica [-itsa]	2.593
mala vučaha	vučašica	medial	č [ʧ]	h [x]	ica [-itsa]	3.119
mala pašoha	pašošica	medial	š [ʃ]	h [x]	ica [-itsa]	2.763
mala družaha	družašica	medial	ž [ʒ]	h [x]	ica [-itsa]	3.051
mali dečok	dečočič	medial	č [ʧ]	k	ič [-iʧ]	2.831
mali rušuk	rušučič	medial	š [ʃ]	k	ič [-iʧ]	3.034
mali drožak	drožačič	medial	ž [ʒ]	k	ič [-iʧ]	3.220
mali dučog	dučožič	medial	č [ʧ]	g	ič [-iʧ]	2.983
mali rošag	rošažič	medial	š [ʃ]	g	ič [-iʧ]	3.136
mali režug	režužič	medial	ž [ʒ]	g	ič [-iʧ]	2.847
mali nočeh	nočešič	medial	č [ʧ]	h [x]	ič [-iʧ]	2.949
mali pašoh	pašošič	medial	š [ʃ]	h [x]	ič [-iʧ]	2.729
mali ljužoh	ljužošič	medial	ž [ʒ]	h [x]	ič [-iʧ]	2.831
mali mlučak	mlučaček	medial	č [ʧ]	k	ek [-ək]	3.203
mali plišuk	plišuček	medial	š [ʃ]	k	ek [-ək]	3.441
mali drežok	drežoček	medial	ž [ʒ]	k	ek [-ək]	3.542
mali bučeg	bučežek	medial	č [ʧ]	g	ek [-ək]	3.051
mali trešog	trešožek	medial	š [ʃ]	g	ek [-ək]	3.169
mali tožag	tožažek	medial	ž [ʒ]	g	ek [-ək]	2.932
mali plečah	plečašek	medial	č [ʧ]	h [x]	ek [-ək]	3.305
mali rašah	rašašek	medial	š [ʃ]	h [x]	ek [-ək]	3.034
mali ražeh	ražešek	medial	ž [ʒ]	h [x]	ek [-ək]	3.136
iz bračoka	bračočen	medial	č [ʧ]	k	en [-ən]	3.356
iz rešoka	rešočen	medial	š [ʃ]	k	en [-ən]	3.424
iz plužaka	plužačen	medial	ž [ʒ]	k	en [-ən]	3.729
iz vičaga	vičažen	medial	č [ʧ]	g	en [-ən]	3.458
iz tušoga	tušožen	medial	š [ʃ]	g	en [-ən]	3.356
iz mležaga	mležažen	medial	ž [ʒ]	g	en [-ən]	3.119
iz ličaha	ličašen	medial	č [ʧ]	h [x]	en [-ən]	3.356
iz blešoha	blešošen	medial	š [ʃ]	h [x]	en [-ən]	3.068
iz rižeha	rižešen	medial	ž [ʒ]	h [x]	en [-ən]	3.525

Table 9: Materials used for Experiment 1 (medial-blocker words) and their mean ratings. Participants were given the prompt (nonce word base form) and its corresponding palatalized form, and asked to rate the acceptability of this form. Slovenian orthography is given for the wordforms; IPA for the blocking postalveolar segment, palatalization target, and suffix are given when they differ from the orthography.

Prompt	Pal. form	Mean rating	Prompt	Pal. form	Mean rating	C $_{\text{Fin}}$	Suffix
mala mebuka	mebučica	3.475	mali lobuk	lobuček	4.051	k	ica [-itsa]
mala moruka	moručica	3.797	mali pluruk	pluruček	3.508	k	ica [-itsa]
mala petoka	petočica	3.797	mali temuk	temuček	3.746	k	ica [-itsa]
mala driboka	dribočica	3.644	mali bodak	bodaček	3.966	k	ica [-itsa]
mala linoka	linočica	3.610	mali turuk	turuček	3.593	k	ica [-itsa]
mala duboka	dubočica	3.746	mali turak	turaček	3.695	k	ica [-itsa]
mala bejuga	bejužica	3.220	mali vemug	vemužek	3.576	g	ica [-itsa]
mala blirega	blirežica	3.407	mali dribog	dribožek	3.576	g	ica [-itsa]
mala bavaga	bavažica	3.475	mali pivug	pivužek	3.458	g	ica [-itsa]
mala riluga	rilužica	3.271	mali juteg	jutežek	3.339	g	ica [-itsa]
mala veraga	veražica	3.644	mali tevog	tevožek	3.373	g	ica [-itsa]
mala ladega	ladežica	3.424	mali bepeg	bepežek	3.475	g	ica [-itsa]
mala jireha	jirešica	3.797	mali rajah	rajašek	3.610	h [x]	ica [-itsa]
mala bramaha	bramašica	3.492	mali meroh	merošek	3.508	h [x]	ica [-itsa]
mala munoha	munošica	3.746	mali munoh	munošek	3.407	h [x]	ica [-itsa]
mala ledeha	ledešica	3.627	mali drubah	drubašek	3.542	h [x]	ica [-itsa]
mala voteha	votešica	3.458	mali jiboh	jibošek	3.424	h [x]	ica [-itsa]
mala tupeha	tupešica	3.576	mali mlejeh	mleješek	3.373	h [x]	ica [-itsa]
mali mejuk	mejučič	3.339	iz vajoka	vajočen	3.695	k	ič [-itʃ]
mali ruduk	rudučič	3.186	iz jopuka	jopučen	3.797	k	ič [-itʃ]
mali dotuk	dotučič	3.322	iz betoka	betočen	3.932	k	ič [-itʃ]
mali ljunak	ljunačič	3.305	iz brotuka	brotučen	3.712	k	ič [-itʃ]
mali vidok	vidočič	3.254	iz jiraka	jiračen	3.644	k	ič [-itʃ]
mali plonok	plonočič	3.305	iz briloka	briločen	3.915	k	ič [-itʃ]
mali dutug	dutužič	3.203	iz metoga	metožen	3.695	g	ič [-itʃ]
mali ropag	ropažič	3.407	iz topaga	topažen	3.797	g	ič [-itʃ]
mali tureg	turežič	3.254	iz drotega	drotežen	3.898	g	ič [-itʃ]
mali tujeg	tuježič	3.237	iz viloga	viložen	3.915	g	ič [-itʃ]
mali debog	debožič	3.153	iz rovoga	rovožen	3.695	g	ič [-itʃ]
mali jepeg	jepežič	3.237	iz prutuga	prutužen	3.712	g	ič [-itʃ]
mali bapeh	bapešič	3.220	iz tebaha	tebašen	3.678	h [x]	ič [-itʃ]
mali prudoh	prudošič	3.203	iz muboha	mubošen	3.780	h [x]	ič [-itʃ]
mali tubeh	tubešič	3.136	iz nivoha	nivošen	3.508	h [x]	ič [-itʃ]
mali jiloh	jilošič	3.203	iz movaha	movašen	3.644	h [x]	ič [-itʃ]
mali doroh	dorošič	3.305	iz tijoha	tijošen	3.475	h [x]	ič [-itʃ]
mali mlodeh	mlodešič	3.186	iz mluteha	mlutešen	3.678	h [x]	ič [-itʃ]

Table 10: Materials used for Experiment 1 (no-blocker words) and their mean ratings. Participants were given the prompt (nonce word base form) and its corresponding palatalized form, and asked to rate the acceptability of this form. Slovenian orthography is given for the wordforms; IPA for the blocking postalveolar segment, palatalization target, and suffix are given when they differ from the orthography.

C_{Fin}=K	Mean rating	C_{Fin}=Š	Mean rating	C_{Fin}	C_{Med}
dibaha	2.480	dibaša	3.180	h/š	b
mlibaha	2.340	mlibaša	2.740	h/š	b
mlaboha	2.320	mlaboša	2.820	h/š	b
nuboha	2.600	nuboša	3.120	h/š	b
nučaha	2.600	nučaša	2.620	h/š	č
tičaha	2.600	tičaša	2.800	h/š	č
pičoha	2.700	pičoša	2.640	h/š	č
večoha	2.560	večoša	2.440	h/š	č
brikaha	2.160	brikaša	3.300	h/š	k
rukaha	2.320	rukaša	3.220	h/š	k
blikoha	2.280	blikoša	3.220	h/š	k
trukoha	2.440	trukoša	2.840	h/š	k
plomaha	2.540	plomaša	3.020	h/š	m
vamaha	2.660	vamaša	3.220	h/š	m
brumoha	2.460	brumoša	3.000	h/š	m
domoha	2.540	domoša	3.060	h/š	m
laraha	2.620	laraša	3.240	h/š	r
pliraha	2.580	pliraša	3.020	h/š	r
boroha	2.540	boroša	3.260	h/š	r
vuroha	2.640	vuroša	3.120	h/š	r
tošaha	2.940	tošaša	2.100	h/š	š
tušaha	2.960	tušaša	2.220	h/š	š
došoha	2.740	došoša	2.020	h/š	š
mašoha	2.880	mašoša	2.180	h/š	š
drabaka	2.640	drabača	3.240	k/č	b
trubaka	2.560	trubača	3.880	k/č	b
viboka	2.960	viboča	2.980	k/č	b
voboka	2.760	voboča	2.980	k/č	b
jučaka	3.160	jučača	2.120	k/č	č
tučaka	3.140	tučača	2.160	k/č	č
bločoka	2.780	bločoča	2.560	k/č	č
ljučoka	2.960	ljučoča	2.420	k/č	č
trekaka	2.260	trekača	3.480	k/č	k
trokaka	2.460	trokača	3.540	k/č	k
blokoka	2.700	blokoča	2.980	k/č	k
vekoka	2.500	vekoča	3.200	k/č	k
drimaka	2.640	drimača	3.220	k/č	m
pramaka	3.080	pramača	2.960	k/č	m
jumoka	2.760	jumoča	2.820	k/č	m
tomoka	2.780	tomoča	3.120	k/č	m
boraka	2.860	borača	3.460	k/č	r
leraka	2.780	lerača	3.240	k/č	r
miroka	2.840	miroča	3.020	k/č	r
vuroka	2.840	vuroča	2.920	k/č	r
blašaka	2.800	blašača	2.640	k/č	š
trašaka	2.940	trašača	2.580	k/č	š
plušoka	2.740	plušoča	2.720	k/č	š
rašoka	2.780	rašoča	2.660	k/č	š

Table 11: Materials used for Experiment 2, Non-derived word task, with their mean ratings. Participants were given the prompt (nonce word base form) and its corresponding palatalized and nonpalatalized forms, and asked to rate the acceptability of each form. Slovenian orthography is given here; IPA correspondences are shown in the tables above.

Prompt	C_{Fin}=K	Mean rating	C_{Fin}=Š	Mean rating	C_{Fin}	C_{Med}	Suffix
iz libaha	libahen	2.800	libašen	3.160	h/š	b	-en
iz mločaha	mločahen	2.660	mločašen	3.160	h/š	č	-en
iz blukaha	blukahen	2.680	blukašen	3.240	h/š	k	-en
iz drimaha	drimahen	2.660	drimašen	3.380	h/š	m	-en
iz beraha	berahen	2.720	berašen	3.360	h/š	r	-en
iz nošaha	nošahen	3.080	nošašen	2.660	h/š	š	-en
iz ruboha	rubohen	2.840	rubošen	3.480	h/š	b	-en
iz pičoha	pičohen	2.960	pičošen	2.980	h/š	č	-en
iz jokoha	jokohen	2.720	jokošen	3.140	h/š	k	-en
iz tremoha	tremohen	2.840	tremošen	3.280	h/š	m	-en
iz mlaroha	mlarohen	2.860	mlarošen	3.300	h/š	r	-en
iz lašoha	lašohen	3.180	lašošen	2.540	h/š	š	-en
iz tribaka	tribaken	2.500	tribačen	3.680	k/č	b	-en
iz dričaka	dričaken	2.700	dričačen	3.080	k/č	č	-en
iz bakaka	bakaken	2.440	bakačen	3.460	k/č	k	-en
iz rimaka	rimaken	2.520	rimačen	3.400	k/č	m	-en
iz meraka	meraken	2.480	meračen	3.600	k/č	r	-en
iz mlašaka	mlašaken	2.720	mlašačen	3.100	k/č	š	-en
iz meboka	meboken	2.600	mebočen	3.560	k/č	b	-en
iz tičoka	tičoken	3.140	tičočen	2.800	k/č	č	-en
iz rikoka	rikoken	2.400	rikočen	3.420	k/č	k	-en
iz nomoka	nomoken	2.720	nomočen	3.400	k/č	m	-en
iz mluroka	mluroken	2.580	mluročen	3.480	k/č	r	-en
iz mlišoka	mlišoken	2.820	mlišočen	3.040	k/č	š	-en
mala nubaha	nubahica	3.340	nubašica	3.040	h/š	b	-ica
mala blečaha	blečahica	3.240	blečašica	2.680	h/š	č	-ica
mala nokaha	nokahica	3.320	nokašica	2.780	h/š	k	-ica
mala lamaha	lamahica	3.360	lamašica	2.920	h/š	m	-ica
mala blaraha	blarahica	3.300	blarašica	3.040	h/š	r	-ica
mala drošaha	drošahica	3.380	drošašica	2.540	h/š	š	-ica
mala mliboha	mlibohica	3.200	mlibošica	3.000	h/š	b	-ica
mala bačoha	bačohica	3.440	bačošica	2.660	h/š	č	-ica
mala nokoha	nokohica	3.140	nokošica	3.020	h/š	k	-ica
mala plomoha	plomohica	3.240	plomošica	3.120	h/š	m	-ica
mala mlaroha	mlarohica	3.100	mlarošica	3.060	h/š	r	-ica
mala bešoha	bešohica	3.400	bešošica	2.500	h/š	š	-ica
mala drebaka	drebakica	3.120	drebačica	3.140	k/č	b	-ica
mala bričaka	bričakica	3.400	bričačica	2.620	k/č	č	-ica
mala dukaka	dukakica	2.880	dukačica	3.400	k/č	k	-ica
mala demaka	demakica	2.960	demačica	3.460	k/č	m	-ica
mala mluraka	mlurakica	3.220	mluračica	3.180	k/č	r	-ica
mala trušaka	trušakica	3.240	trušačica	2.960	k/č	š	-ica
mala doboka	dobokica	3.080	dobočica	3.340	k/č	b	-ica
mala blečoka	blečokica	3.240	blečočica	2.920	k/č	č	-ica
mala lokoka	lokokica	3.240	lokočica	3.280	k/č	k	-ica
mala blamoka	blamokica	3.080	blamočica	3.300	k/č	m	-ica
mala joroka	jorokica	3.300	joročica	3.120	k/č	r	-ica
mala našoka	našokica	3.400	našočica	2.760	k/č	š	-ica

Table 12: Materials used for Experiment 2, Derived word task, with their mean ratings. Participants were asked to rate the acceptability of each form. Slovenian orthography is given here; IPA correspondences are shown in the tables above.

Factor	β-coefficient	t-value	p	
Intercept (mean rating)	3.332	20.059	$< .001$	***
BlockerPresence	0.294	6.026	$< .001$	***
BlockerPosition	0.213	4.897	$< .001$	***
C_{Fin} *x* (vs. *g*)	0.031	0.833	0.407	
C_{Fin} *k* (vs. *g*)	0.198	4.495	$< .001$	***
Suffix *-ən* (vs. *-ək*)	0.171	1.446	0.153	
Suffix *-itʃ* (vs. *-ək*)	−0.291	−3.471	0.001	**
Suffix *-itsa* (vs. *-ək*)	−0.140	−1.855	0.068	
BlockerPresence : C_{Fin} *x*	−0.037	−0.706	0.482	
BlockerPosition : C_{Fin} *x*	0.001	0.019	0.985	
BlockerPresence : C_{Fin} *k*	−0.073	−1.372	0.173	
BlockerPosition : C_{Fin} *k*	−0.058	−0.772	0.442	
BlockerPresence : Suffix *-ən*	−0.011	−0.185	0.854	
BlockerPosition : Suffix *-ən*	$< .001$	$< .001$	1.000	
BlockerPresence : Suffix *-itʃ*	−0.043	−0.707	0.481	
BlockerPosition : Suffix *-itʃ*	−0.053	−0.609	0.544	
BlockerPresence : Suffix *-itsa*	0.208	3.399	0.001	**
BlockerPosition : Suffix *-itsa*	0.023	0.261	0.795	
C_{Fin} *x* : Suffix *-ən*	−0.041	−0.524	0.601	
C_{Fin} *k* : Suffix *-ən*	−0.153	−1.942	0.055	
C_{Fin} *x* : Suffix *-itʃ*	−0.134	−1.692	0.094	
C_{Fin} *k* : Suffix *-itʃ*	−0.234	−2.966	0.004	**
C_{Fin} *x* : Suffix *-itsa*	0.222	2.811	0.006	**
C_{Fin} *k* : Suffix *-itsa*	0.051	0.643	0.521	
BlockerPresence : C_{Fin} *x* : Suffix *-ən*	−0.192	−1.281	0.203	
BlockerPosition : C_{Fin} *x* : Suffix *-ən*	0.249	1.172	0.244	
BlockerPresence : C_{Fin} *k* : Suffix *-ən*	−0.215	−1.431	0.155	
BlockerPosition : C_{Fin} *k* : Suffix *-ən*	0.141	0.666	0.507	
BlockerPresence : C_{Fin} *x* : Suffix *-itʃ*	0.124	0.829	0.409	
BlockerPosition : C_{Fin} *x* : Suffix *-itʃ*	0.169	0.799	0.426	
BlockerPresence : C_{Fin} *k* : Suffix *-itʃ*	−0.034	−0.226	0.822	
BlockerPosition : C_{Fin} *k* : Suffix *-itʃ*	0.164	0.772	0.442	
BlockerPresence : C_{Fin} *x* : Suffix *-itsa*	−0.037	−0.245	0.807	
BlockerPosition : C_{Fin} *x* : Suffix *-itsa*	0.266	1.252	0.213	
BlockerPresence : C_{Fin} *k* : Suffix *-itsa*	−0.110	−0.735	0.464	
BlockerPosition : C_{Fin} *k* : Suffix *-itsa*	0.006	0.027	0.979	

Table 13: Full statistical results from full model predicting acceptability ratings from BlockerPosition, C_{Fin}, and Suffix in Experiment 1. The formula used was: `rating ~ BlockerPosition * PalTarget * Suffix + (BlockerPosition + PalTarget + Suffix | Participant) + (1 | Item)`

Factor	β-coefficient	t-value	p	
Intercept (mean rating)	3.370	20.217	$< .001$	***
BlockerPresence	0.238	5.601	$< .001$	***
BlockerPosition	0.172	4.125	$< .001$	***
C_{Fin} *x* (vs. *g*)	0.007	0.169	0.866	
C_{Fin} *k* (vs. *g*)	0.173	4.050	$< .001$	***
Suffix *-ən* (vs. *-ək*)	0.198	1.680	0.098	.
Suffix *-itʃ*	−0.286	−3.389	0.001	**
Suffix *-itsa*	−0.134	−1.842	0.070	.
BlockerPresence : C_{Fin} *x*	−0.002	−0.034	0.973	
BlockerPosition : C_{Fin} *x*	−0.087	−1.095	0.277	
BlockerPresence : C_{Fin} *k*	−0.036	−0.697	0.488	
BlockerPosition : C_{Fin} *k*	−0.108	−1.362	0.177	
BlockerPresence : Suffix *-ən*	−0.051	−0.860	0.392	
BlockerPosition : Suffix *-ən*	0.028	0.308	0.758	
BlockerPresence : Suffix *-itʃ*	−0.052	−0.876	0.383	
BlockerPosition : Suffix *-itʃ*	−0.040	−0.432	0.667	
BlockerPresence : Suffix *-itsa*	0.200	3.377	0.001	**
BlockerPosition : Suffix *-itsa*	0.056	0.617	0.539	
target *x* : Suffix *-ən*	0.003	0.035	0.972	
target *k* : Suffix *-ən*	−0.136	−1.679	0.097	.
target *x* : Suffix *-itʃ*	−0.113	−1.399	0.165	
target *k* : Suffix *-itʃ*	−0.187	−2.320	0.023	*
target *x* : Suffix *-itsa*	0.224	2.775	0.007	**
target *k* : Suffix *-itsa*	0.026	0.326	0.745	
BlockerPresence : C_{Fin} *x* : Suffix *-ən*	−0.258	−1.785	0.078	.
BlockerPosition : C_{Fin} *x* : Suffix *-ən*	0.331	1.473	0.144	
BlockerPresence : C_{Fin} *k* : Suffix *-ən*	−0.242	−1.668	0.099	.
BlockerPosition : C_{Fin} *k* : Suffix *-ən*	0.314	1.398	0.166	
BlockerPresence : C_{Fin} *x* : Suffix *-itʃ*	0.093	0.644	0.521	
BlockerPosition : C_{Fin} *x* : Suffix *-itʃ*	0.271	1.209	0.230	
BlockerPresence : C_{Fin} *k* : Suffix *-itʃ*	−0.105	−0.722	0.472	
BlockerPosition : C_{Fin} *k* : Suffix *-itʃ*	0.322	1.436	0.155	
BlockerPresence : C_{Fin} *x* : Suffix *-itsa*	−0.040	−0.273	0.785	
BlockerPosition : C_{Fin} *x* : Suffix *-itsa*	0.237	1.058	0.293	
BlockerPresence : C_{Fin} *k* : Suffix *-itsa*	−0.073	−0.507	0.613	
BlockerPosition : C_{Fin} *k* : Suffix *-itsa*	0.186	0.831	0.408	

Table 14: Model identical to original model (Table 13), but excluding wordforms that would result in the target segment being identical to the postalveolar blocker when palatalized. The formula used was: `rating ~ BlockerPosition * PalTarget * Suffix + (BlockerPosition + PalTarget + Suffix | Participant) + (1 | Item)`