Homophony Avoidance in the Grammar: Russian Nominal Allomorphy

1 Introduction

Homophony avoidance is a contrast-based approach in which a wellformedness of each form is evaluated with respect to all contrasts in a system (Padgett, 2003). Other frameworks that deal with contrast include Dispersion Theory in phonetics (Flemming, 1995; Ní Chiosáin & Padgett, 2020) and Preserve Contrast Theory in phonology (Riggs, 2007; Lubowicz, 2012; Lubowicz, 2016). Contrast preservation has also been posited in diachronic linguistics in the functional load hypothesis (Martinet, 1955), as well as the mechanism behind taboo replacement (Baerman, 2010; Campbell, 2013). Homophony avoidance in particular has most often been employed to account for otherwise exceptional phonological and morphophonological processes, such as the blocking of regular sound change in Trigrad Bulgarian, Russian (Crosswhite, 1999), and Teiwa (Baerman, 2010), sporadic changes in Dalkelh (Gessner & Hansson, 2004), Russian, Belarusian (Bethin, 2012), and defective morphological paradigms in Mazatec, Tamashek, and Icelandic (Baerman, 2010). However, it is not clear if homophony avoidance constitutes a synchronic restriction in the grammar of the speaker or, as has been argued (Blevins & Wedel, 2009; Mondon, 2010), an emergent diachronic development born of imperfect transmission.

This paper attempts to mend the gap found in the literature by discussing a correlation of stress pattern and allomorph choice in Russian masculine nominals. I show that the patterns observed in the language can be ascribed to a combination of homophony avoidance and another restriction, namely paradigm uniformity. A nonce word task was constructed so as to limit the effects of paradigm uniformity and, therefore, test homophony avoidance exclusively. Results confirm not only that the restriction found in Russian masculine nominals is productive, but that synchronic homophony avoidance is the most likely explanation.

The Russian data discussed in this paper is similar to the famous example of homophony avoidance in Trigrad Bulgarian (Crosswhite, 1999; based on data from Stojkov, 1963), which I summarize below. In the Trigrad dialect of Bulgarian, vowel reduction and stress conspire to preserve contrast within the morphological paradigm. An illustration of the vowel reduction

process is shown in Figure 1. In unstressed position, the mid-back vowels [o] and [ɔ] merge with [a], while the closed mid front [ɛ] merges with [e].

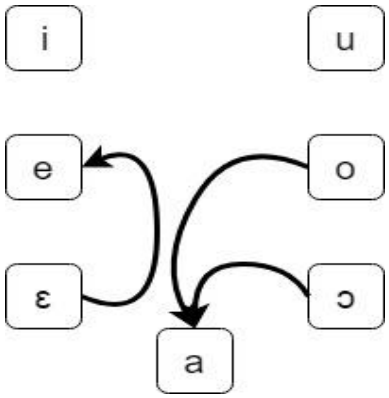

Figure 1: The Trigrad Vowel System. Direction of mergers in unstressed position is indicated with arrows

The reduction can be observed in stems where stress shifts due to suffixation, as in (1). Contrast the full vowels in the stem of the indefinite with the reduced vowels in the definite. Note that the neuter suffix [-o] also undergoes reduction in the indefinite form.

(1) Vowel Reduction in Trigrad Bulgarian

Indefinite	Definite	Gloss
ˈkl**ɔ**b-a	kl**a**ˈb-o-ta	‘globe’
ˈ**o**k-a	**a**ˈk-o-ta	‘eye’
ˈs**ɛ**n-a	s**e**ˈn-o-ta	‘hay’

However, vowel reduction fails to apply in certain morphological environments. Of particular interest is the neuter singular suffix [-o], which reduces to [a] in some stems, as in (2a), but not others, as in (2b). Whether the suffix reduces in a given stem is not predictable from the neuter singular alone.

Variable Reduction of Neuter Singular -o

	Singular	Plural	Gloss
(2a)	kaˈpit-**a**	kapiˈt-**a**	‘hoof’
	ˈper-**a**	peˈr-**a**	‘pen’
	ˈklɔb-**a**	klaˈb-**a**	‘globe’
(b)	ˈzɔrn-**o**	ˈzɔrn-**a**	‘seed’
	ˈblag-**o**	ˈblag-**a**	‘good’
	t͡sigaˈril-**o**	t͡sigaˈril-**a**	‘cigarette’

Crosswhite (1999) demonstrates that the vowel reduction in the neuter singular suffix is entirely predictable if the plural form is taken into consideration. The neuter plural marker in Trigrad Bulgarian is underlyingly [-a]. Because unstressed [o] → [a], vowel reduction has the potential to create homophonous singular ~ plural pairs.

However, no homophonous singular ~ plural pairs are found in the dialect. In (2a), where the singular and plural forms differ in stress placement, vowel reduction applies normally and does not produce homophony. In (2b), where the singular and plural match in stress placement, vowel reduction fails to apply. In other words, the singular is always disambiguated from the plural, either prosodically or segmentally. The application of vowel reduction, which appears sporadic when looking at a single form, is entirely predictable when the paradigm is taken into account. Crosswhite (1999) argues that the blocking of vowel reduction in Trigrad Bulgarian is best described synchronically and models the phenomenon in OT. Even so, Mondon (2009) gives an entirely diachronic account, arguing that the data can just as easily be explained by competing grammars, one with reduction and one without, merging over time in a way that increases communicability.

In fact, it has been argued that all instances of homophony avoidance can be explained diachronically (Kroch, 1989; Labov, 1994; Mondon, 2010). Homophonous productions are more likely to be misinterpreted and thus contribute to the mental representation of the competitor, whereas contrastive productions are likely to contribute to the mental representation of the intended target. Over time this results in the gradual divergence of mental representations, something that is supported by computational models (Blevins & Wedel, 2009; Winter & Wedel, 2016). An emergent gradual divergence such as this one removes the need to posit an active anti-homophony restriction in the grammar. Instead, homophony avoidance can be achieved through errors in transmission and language learning. Artificial language learning paradigms have found a learning bias compatible with this framework (Heng Yin & White, 2018). More generally, in any evolutionary framework multiple entities occupying the same niche tend to be unstable and diverge over time, a trend that has also been observed outside of linguistics, for example in biology (see Pocheville, 2014 for an overview of the *competitive exclusion principle*).

As such, it is often assumed that a synchronic restriction against homophony is not sufficiently motivated (King, 1967; Mondon, 2009; Paster, 2012; Sampson, 2013). However, few

experimental studies have broached the subject. One exception is Ichimura (2006), which presents a production experiment performed on Japanese verbs. Results from the experiment suggest that speakers are less likely to apply an optional nasal assimilation process when this results in homophony with a competing word. However, it has been subsequently claimed that the results are best analyzed as positional faithfulness rather than homophony avoidance (Kaplan & Muratani, 2015). Therefore, it is still a matter of debate whether examples of synchronic restrictions on homophony exist.

Hence, this paper presents experimental and corpus data from Russian in evidence of a synchronic restriction against homophony. In §2, I provide necessary language background on Russian phonology and nominal morphology. Specifically, I focus on two sets of allomorphs in the masculine nominal paradigm. One member of each set is potentially homophonous with another. In §3, I describe a corpus study, in which I find that the selected allomorphs hardly ever produce homophonous pairs in the paradigm. Similar to the Trigrad Bulgarian example in (2), allomorphy conspires with stress to ensure contrast within the paradigm. Therefore, I claim that this pattern is indicative of homophony avoidance in the language. In §4, I describe a nonce-word perception experiment, which was conducted exploiting the potential homophony caused by allomorph selection. The results of the experiment indicate that the prosodic disambiguation strategy is productive. Finally, in the discussion §5, I show that the results are not compatible with the simple projection of lexicon trends and are best analyzed as homophony restriction encoded in the synchronic grammar.

2 Russian Stress Paradigms

Russian has a free lexical stress system. Stress can be assigned to any syllable within the stem, e.g. [ˈzagovor-amʲi] ‘with the conspiracies’ and [ugoˈvor-amʲi] ‘with the persuasions’, as well as to the first syllable of the inflectional suffix, as in [dogovoˈr-amʲi] ‘with the agreements’.

In the nominal paradigm, stress generally remains consistent within the same grammatical number, sg. or pl., but not necessarily between the two. For masculine nouns where stress is inconsistent, it is usually the case that the singular bears stem stress while the plural bears suffix stress. Therefore, there are three general stress patterns; following terminology from Coats

(1976), I outline these in (3). The singular and plural instrumental forms were given as an example; stress placement in other cases will match the example of the same grammatical number.

(3) Russian Stress Patterns

Stress Pattern	Singular (inst.)	Plural (inst.)	Gloss
Stable	ˈ**ter**mos-om	ˈ**ter**mos-amʲi	thermos
End	torgaˈ**ʂ-om**	torgaˈ**ʂ-a**mʲi	haggler
Mobile	ˈ**tor**moz-om	tormoˈ**z-a**mʲi	brake

Nouns with a **stable** pattern have stem stress in both the singular and plural. Nouns with an **end** pattern have suffix stress in both the singular and plural. Nouns with a **mobile** pattern have stem stress in the singular but suffix stress in the plural. In the literature, these patterns are also referred to by the single-letter codes A, B, C (Zalzniak, 1985; Halle, 1995), or by double-letter codes AA, BB, AB (Fedianina, 1982), or by the descriptive notation {Rsg : Rpl}, {Esg : Epl}, {Rsg : Epl} (Timberlake, 2004), all respectively.

Other stress patterns do exist, including suffix stress in the singular and stem stress in the plural, as well as many exceptional patterns with variable stress within grammatical number. However, as will be shown in §3, the patterns in (3) comprise more than 99% of masculine nouns. Because the other stress patterns are rare and not relevant to this project, they will not be discussed further.

Russian nominals possess a rich inflectional system, with suffixes corresponding to combinations of gender, number, and case. The inflectional suffixes for Russian masculine nominals can be seen in Table 1, with the more common allomorph listed first. Where more than one exponent is listed, the suffix shape is conditioned lexically and not predictable from the stem. Contrast, the nominative singular and nominative plural forms in [tom]~[tom-a] ‘tome’ and [atom]~[atom-i] ‘atom’ with [tom]~*[tom-i] and [atom]~*[atom-a].

Table 1: Russian Masculine Declension

	Singular	Plural
Nominative	-Ø	-i | **-a**
Genitive	**-a** | -u	-ov[1]
Dative	**-u**	-am
Instrumental	-om	-amʲi
Prepositional	-ʲe | **-u**	-ax

Note that some of the secondary allomorphs are potentially homophonous with other forms in the paradigm. Thus, the secondary nominative plural marker [-a] is identical to the genitive singular [-a]. Likewise, the secondary prepositional and genitive markers, both [-u], are potentially homophonous with the dative singular [-u]. In the remainder of this paper, I will argue that the distribution of two of these potentially homophonous allomorphs, namely the [-a] nominative plural and [-u] prepositional singular, is conditioned by homophony avoidance.

The [-a] nominative plural allomorph will be addressed in §3.1. Most Russian masculine nouns take the nominative plural suffix [-i], which is also found in related Slavic languages, e.g. Slovak [xleb-i] ‘breads’. However, it appears that during the 15th century a new nominative plural suffix [-a] began to diffuse in the language, e.g. Modern Russian [xlʲeˈb-a] ‘breads’. This allomorph attached only to a handful of nouns at first but has been spreading to more and more stems ever since (Yanovich, 1986). The origins of this suffix are complex. The old nominative dual, which was already on the decline at the time (Shakhmatov, 1975; Yanovich, 1986; Timberlake, 2004) was also [-a], and a number of semantically paired nouns preserve the original dual [-a], now reanalyzed as a plural marker, such as [rog-a] ‘horns’ and [bʲerʲeg-a] ‘banks (of a river)’. Once the plural/dual distinction was lost, the suffix also began to be applied to nouns that are not semantically paired, such as [gorod-a] ‘cities’ and [golos-a] ‘voices’. The spread of the [-a] nominative plural may have been galvanized by the fact that neuter nouns take [-a] as a plural suffix; this is especially crucial because the morphological gender distinction in the plural had already begun to deteriorate (Yanovich, 1986). Although the proliferation of the new allomorph had been steady since the late Middle Ages, it seems to have slowed down in the twentieth

[1] There are two additional exponents for the genitive plural. There is a phonologically conditioned allomorph [-ej], which follows *soft* consonants, i.e. palatalized or post-alveolar.
Additionally, there is a null genitive plural allomorph -Ø, which is potentially homophonous with the nominative singular. However, this suffix is extremely uncommon in masculine nouns (though more common in feminine and neuter nouns). Nevertheless, it has been found that the distribution of the null genitive plural allomorph in Russian nouns in general is also conditioned by homophony avoidance (Pertsova, 2015).

century. Nowadays, its use is somewhat more widespread in trade jargon than in standard speech (Krysin, 1974).

The [-u] prepositional singular allomorph will be addressed in §3.2. Most Russian masculine nouns take the prepositional singular suffix [-ʲe]. However, a handful of nouns take the suffix [-u]. The nouns that do take the [-u] prepositional singular only do so when governed by the prepositions [v] ‘in’ and [na] ‘on’. After the preposition, [o] ‘about’, [po] ‘on top of’, and [prʲi] ‘by’, all of which require the prepositional case, the more widespread [-ʲe] suffix must be used instead (Timberlake, 2004). Thus, the stem *forest* and *city* take different suffixes in [v lʲes-u] ‘in the forest’ and [v ˈgorod-ʲe] ‘in the city’, but the same suffix in [o ˈles-ʲe] ‘about the forest’ and [o ˈgorod-ʲe] ‘about the city’. Historically, the two prepositional singular suffixes existed in different inflectional paradigms (Yanovich, 1986). As the paradigms began to merge, [-ʲe] dominated and words with the [-u] prepositional singular decreased in number. In modern Russian, the use of [-u] appears to be limited but stable (Krysin, 1974).

Finally, something must be said of the genitive singular [-u]. Like the prepositional singular [-u], this suffix is also restricted both lexically and semantically. The [-u] genitive singular appears only in a handful of nouns and mainly in partitive or partitive-like constructions (Timberlake, 2004). However, unlike the prepositional singular [-u], the genitive singular can always be substituted by the more widespread allomorph [-a] but not *vice versa* (Timberlake, 2004). Therefore, the stem *sugar* can optionally take either suffix in [nʲeˈmnogo ˈsaxar-u] or [nʲeˈmnogo ˈsaxar-a] ‘a little bit of sugar’, but only the more common allomorph in [t͡svet ˈsaxar-a] ‘color of sugar’ (*[t͡svet ˈsaxar-u]). Akin to the allomorphy in the prepositional singular, the two genitive singular suffixes also originated from different inflectional paradigms. The partitive nature of the [-u] variant is sometimes attributed to a few salient nouns, such as *honey*, *wax*, and *hops*, which both took the [-u] genitive singular and were partial to partitive constructions (Yanovich, 1986). In modern Russian, it appears that the [-u] genitive singular is on the decline, particularly in the younger generation (Krysin, 1974).

It should be noted that, unlike with the other two potentially homophonous suffixes, homophony with the [-u] genitive singular is not avoided. In fact, the [-u] genitive singular is always homophonous with the dative singular in the language, e.g. [ˈsaxar-u] ‘sugar (dat. sing.)’ or

‘sugar (gen. sg.)’. It is unclear why the [-u] genitive singular is treated differently from the [-u] prepositional singular and the [-a] nominative plural. The fact that is can always be replaced by the more common [-a] may play a role in the explanation, but it is impossible to say conclusively at the moment. Because the same analysis cannot be extended to the [-u] genitive singular, it will not be discussed in this paper any further.

With respect to stress and its distribution in the other two instances of allomorphy, two patterns are conceivable. On one hand, if the choice of suffix and stress pattern are entirely independent, for a large number of the words that take a potentially homophonous suffix stress is expected to remain consistent within the paradigm, allowing homophony with a competing form. On the other hand, if, just as in Trigrad Bulgarian, Russian uses stress to disambiguate homophonous forms within the paradigm, suffix choice and stress pattern are expected to conspire to evade homophony. In the following section, I present a case study demonstrating that the latter distribution holds true.

3 Corpus Study

3.1 Method

To acquire a wordlist of common Russian nouns, data was taken from the General Internet Corpus of Russian (Belikov et al., 2013a, b) Silver Standard Version 1.2, hence GICR. The corpus is wholly orthographic and comprises some 2 million words collected from Russian social media. All words in the corpus are morphologically parsed for gender, case and number. Masculine nouns were extracted from the corpus and filtered manually according to the needs of this project. Proper nouns, abbreviations and indeclinable loans were removed, as were *pluralia tantum*, deadjectival nouns, and masculine nouns that take feminine morphology. To remove foreign words and spurious coinages, only nouns appearing at least twice in the GICR were kept. A total of 4230 Russian masculine nouns fit these criteria.

As stress is not normally indicated in Russian orthography, stress pattern for each entry was subsequently assigned manually by the author of this paper. Therefore, GICR was merely used to obtain a list of common Russian nouns, whereas the results reflect the intuitions of the author. Because there exists some between-speaker variation in Russian accentuation (Sharapova, 2000;

Lagerberg, 2011), a specialized dictionary, developed to document the stress pattern of unusual or obscure Russian words (Shtudiner, 2016), was consulted in all but the trivial cases. Trivial cases (84.9%) were defined as those with stable stress and the common nominative plural and prepositional singular allomorphs. It is unlikely that the author's personal bias had a significant effect on the results. However, if a bias is present, it is manifested as a slight overrepresentation of stable stress, as well as the [-i] nominative plural and [-ʲe] prepositional singular allomorphs, something which is unlikely to affect the analysis.

Occasionally, the dictionary listed several stress patterns as optional variants; in such cases, a separate entry for each stress pattern was made. All in all, there were 120 (2.8%) entries with more than one stress pattern. For a breakdown of masculine nouns by stress pattern see Table 2.

Table 2: Russian masculine nouns by stress pattern

Stress Pattern	count	proportion
Stable	3607	.853
End	463	.109
Mobile	128	.030
Other	32	.008
Total	**4230**	**1.000**

The overwhelming majority of masculine nouns have a stable stress pattern, with stress on the same syllable in the stem in both the singular and plural. A large number of masculine nouns have an end stress pattern, with stress on the first syllable of the inflectional suffix in both the singular and plural. A small number of masculine nouns have a mobile stress pattern, with stress on a syllable in the stem in the singular and on the suffix in the plural. As mentioned above, other stress patterns are rare and comprise less than 1% of the corpus.

3.2 Corpus Results

3.2.1 Nominative Plural ~ Genitive Singular Homophony

Recall that the nominative plural for Russian masculine nouns can be signalled with one of two suffixes, [-i] or [-a], the latter of which is homophonous with the genitive singular suffix. The choice of suffix is lexical. For the distribution of stress pattern with regard to suffix choice, see Table 3.

Table 3: Masculine nouns by stress pattern and nom. pl. allomorph

	-i	-a	-a prop	**Total**
Stable	3579	28	.008	**3607**
End	462	1	.002	**463**
Mobile	55	73	.57	**128**
Other	29	3	.094	**32**
Total	**4125**	**105**	.025	**4230**

Masculine nouns that take the [-i] nominative plural allomorph are overwhelmingly more common, comprising 97.5% of the data. Nouns that the [-a] allomorph are not only rare, but their distribution in terms of stress pattern differs radically from the norm: mobile stress is most common, followed by stable stress and finally by end stress.

Of the 105 nouns that take the [-a] nominative plural suffix, 69.5% exhibit a mobile stress pattern. In the remainder of the language, mobile stress is extremely rare, occurring in around 1.3% of words. The trend for the nominative plural [-a] allomorph to cooccur with mobile stress has been noted previously (Coats, 1976; Zalizniak, 1985; Timberlake, 2004; Lagerberg, 2011); while the link to homophony avoidance has not been made, it has been hypothesized that the mobile stress pattern helps increase contrast between singular and plural forms in general (Alderete, 2013).

Homophony avoidance offers an explanation for the asymmetry: a mobile stress pattern preserves the distinction between singular and plural forms that take homophonous suffixes, as shown in (4). Stress is assigned to the stem in the genitive singular and to the suffix in the nominative plural. The potentially homophonous forms are disambiguated prosodically.

(4) Nom. pl. ~ gen. sg. Homophony Disambiguated Prosodically

gen. sg.	nom. pl.	gloss
ˈmʲex-a	mʲeˈx-a	fur
ˈglaz-a	glaˈz-a	eye
ˈnomʲer-a	nomʲeˈr-a	number
uˈt͡ɕitʲelʲ-a	ut͡ɕitʲeˈlʲ-a	teacher
ˈkolokol-a	kolokoˈl-a	bell

In Table 3, we see that a number of nouns that take the [-a] nominative plural suffix do not exhibit a mobile or regressive stress pattern. However, these nouns also display homophony avoidance, not prosodically but morphologically. All 28 nouns that take the [-a] nominative plural suffix and exhibit a stable stress pattern have a suppleted plural stem, as shown in (5).[2] These nouns are exceptional, in that their singular stem is different from their plural stem.

(5) Nom. pl. ~ gen. sg. Homophony Disambiguated Morphologically

gen. sg.	nom. pl.	Gloss
xoˈzʲain-a	xoˈzʲajev-a	owner
ˈbrat-a	ˈbratʲj-a	brother
ˈstrup-a	ˈstrupʲj-a	scab
ˈklok-a	ˈklot͡ɕj-a	tuft
koˈtʲonk-a	koˈtʲat-a	kitten

Observe that in (5) the genitive singular and nominative plural display different, though historically related, stems. The alterations in the stems, such as the appearance of stem-final [j] in the nominative plural of *brother*, *scab*, and *tuft*, are not synchronically active in Russian and are limited to these and a handful of other nouns. The potentially homophonous forms in (5) are disambiguated morphologically.

In the corpus, there is only one true exception to the nom. pl. ~ gen. sg. homophony avoidance generalization. The word [rukav] ‘sleeve’ takes the [-a] nominative plural and exhibits an end stress pattern without stem suppletion. The genitive singular and nominative plural for this word share the form [rukaˈv-a]. This particular noun is aberrant likely because, due to its semantically paired nature, it is one of the few that had the [-a] ending originally, rather than as a result of the subsequent spread (Yanovich, 1986).

For completeness, it should also be mentioned that, for the three nouns that take the [-a] nom. pl. suffix but do not conform to any of the three main stress patterns (‘Other’ in Table 3), the nominative plural and genitive singular are not homophonous. Therefore, for all but one

[2] An anonymous reviewer correctly points out that the stressed nominative plural [-a] (occurring in the mobile and end stress patterns) and the unstressed nominative plural [-a] (occurring in the stable stress pattern) have different historic origins. I will treat them as the same suffix regardless, as they have the same phonological shape (stress notwithstanding) and grammatic function. This decision makes the discussion simpler but does not fundamentally alter the argument.

masculine nouns in the corpus, the nom. pl. ~ gen. sg. pair of suffixes, despite being themselves potentially homophonous, fail to produce homophonous forms. For words with identical singular and plural stems (4), stress is mobile, and the forms are disambiguated prosodically. For words with a stable stress pattern (5), the forms are disambiguated morphologically. The generalization is extremely robust, and a Chi-Square test for independence performed on stress pattern and nominative plural suffix yields that the two are not independent ($p < .0001$, $df = 3$, $\chi^2 = 1633$).

Further evidence of the same homophony avoidance pattern comes from words that, according to the consulted dictionary (Shtudiner, 2016), optionally take either nominative plural suffix, as in (6). In all of these words, the potentially homophonous [-a] suffix is coupled with suffix stress on the nominative plural, and the non-homophonous [-i] suffix with stem stress. Contrast between the genitive singular and the nominative plural is always preserved: if the genitive singular matches the stress of the nominative plural, the two will differ in suffix; if the genitive singular matches the suffix of the nominative plural, the two will differ in stress.

(6) Covariation of Suffix and Stress

gen. sg.	-i nom. pl.	-a nom. pl.	Gloss
ˈflʲuger-a	ˈflʲuger-i	flʲugeˈr-a	vane
ˈpolʲus-a	ˈpolʲus-i	polʲuˈs-a	pole (geo.)
ˈtrʲufʲelʲ-a	ˈtrʲufʲelʲ-i	trʲufʲeˈlʲ-a	truffle
ˈpudʲelʲ-a	ˈpudʲelʲ-i	pudʲeˈlʲ-a	poodle

Note that the dictionary (Shtudiner, 2016) occasionally listed different stress patterns for different meanings. For example, [lagerʲ] ‘camp’ is listed with stable stress when referring to a political camp (nom. pl. [ˈlagerʲ-i]) but with mobile stress when referring to a military camp (nom. pl. [lageˈrʲ-a]). Likewise, [utɕitʲelʲ] ‘teacher’ is listed with stable stress when referring to the founder of a doctrine (nom. pl. [uˈtɕitʲelʲ-i]) but with mobile stress when referring to an educator (nom. pl. [utɕitʲeˈlʲ-a]). Here too, the [-a] nom. pl. suffix cooccurs with mobile stress, while the [-i] nom. pl. suffix cooccurs with stable stress.

Finally, evidence of homophony avoidance comes from diachrony. As previously mentioned, many words have switched from the [-i] nominative plural to the [-a] nominative plural. These

changes were historically always accompanied by a change from a stable to a mobile stress pattern, cf. modern Russian [toˈm-a] ‘tomes’ and 19th century [ˈtom-i].[3]

3.2.2 Prepositional Singular ~ Dative Singular Homophony

Similar to the nominative plural, the prepositional singular for Russian nouns can be signalled with one of two suffixes, [-ʲe] or [-u], the latter of which is homophonous with the dative singular. The [-u], but not the [-ʲe], violates the generalizations presented in §2. Regardless of the stress pattern, the [-u] prepositional singular suffix is always stressed (Fedianina, 1982), a property that can be traced as far back as proto-Balto-Slavic (Shakhmatov, 1957). See, for example, the declension of [lʲes] ‘forest’ in (7). This word exhibits mobile stress: all forms in the plural bear suffix stress, and all forms in the singular bear stem stress. The prepositional singular is the one exception and bears stress on the suffix. Note that nouns that take the [-u] prepositional singular were not counted as exceptional in the corpus study if all other forms conformed to one of the three stress patterns in (3).

(7) Declension of /lʲes/ ‘forest’

case	singular	plural
nom./acc.	lʲes-Ø	lʲeˈs-a
gen.	ˈlʲes-a	lʲeˈs-ov
dat.	ˈlʲes-u	lʲeˈs-am
instr.	ˈlʲes-om	lʲeˈs-amʲi
prep.	**lʲeˈs-u**	lʲeˈs-ax

Like in nom. pl. ~ gen. sg. homophony avoidance, the stress pattern of the word determines if the dative singular and the prepositional singular are homophonous. Because both potentially homophonous forms are singular, the plural forms are not relevant. The dative singular and prepositional singular are homophonous if the singular bears suffix stress. Therefore, homophony between the dative and prepositional [-u] occurs in the end stress pattern. For the distribution of stress pattern with regard to suffix choice, see Table 4.

[3] As in Nekrasov’s *Russian Women* (1872) lines 10-12, where the rhyme between томы [tomi] ‘tomes’ and the verb знакомы [znaˈkomi] ‘acquainted’ confirms that the [-i] nominative plural suffix was coupled with stem stress.

Table 4: Masculine nouns by stress pattern and prep. sg. allomorph

	-ʲe	-u	-u prop.	**Total**
Stable	3594	13	.004	**3607**
End	456	7	.015	**463**
Mobile	84	44	.344	**128**
Other	23	9	.281	**32**
Total	**4157**	**73**	.017	**4230**

Note that masculine nouns that take the [-ʲe] prepositional singular allomorph are overwhelmingly more common, comprising 98.3% of the data. Nouns that the [-u] allomorph are not only rare, but their distribution in terms of stress pattern differs from the norm: mobile stress is most common, followed by stable stress and finally by end stress and other stress patterns.

Of the 73 nouns that take the /-u/ prepositional singular suffix, a smaller proportion exhibit an end stress pattern than both mobile and stable stress. In the remainder of the language, end stress is the second most common pattern. Homophony avoidance is a tempting explanation for this asymmetry. Stable and mobile stress patterns preserve contrast between the dative singular and the exceptional prepositional singular forms, as in (8). Stress is assigned to the stem in all singular forms except for the prepositional, and the potentially homophonous forms are disambiguated prosodically.

(8) Prep. sg. ~ dat. sg. Homophony Disambiguated Prosodically

dat. sg.	prep. sg.	gloss
ˈlʲes-u	lʲeˈs-u	forest
ˈmozg-u	mozˈg-u	brain
ˈʂkaf-u	ʂkaˈf-u	dresser
dʲetˈsad-u	dʲetsaˈd-u	kindergarten
aeroˈport-u	aeropoˈrt-u	airport

While a stable or mobile stress pattern maintains contrast between the prepositional and dative singular, we see in Table 4 that a minority of nouns that take the [-u] prepositional suffix do not exhibit either of these patterns. The seven end stressed nouns constitute genuine exceptions to the generalization: [moˈst-u] ‘bridge (dat./prep. sg.)’, [plaˈst-u] ‘stratum (dat./prep. sg.)’, [ploˈt-u] ‘raft’, [polˈk-u] ‘platoon (dat./prep. sg.)’, [pruˈd-u] ‘pond (dat./prep. sg.)’, and the diminutives [luʐˈk-u] ‘little meadow (dat./prep. sg.)’ and [puˈʂk-u] ‘little fluff (dat./prep. sg.)’. Additionally,

three irregularly stressed nouns bear the same stress assignment on the prepositional and dative singular: [uˈgl-u] ‘corner (dat./prep. sg.)’, [koˈl-u] ‘stake (dat./prep. sg.)’, and [suˈk-u] ‘bough (dat./prep. sg.)’. Finally like all Slavic languages, Russian exhibits vowel~zero alteration in some stems due to the loss of the so called *yer* vowels (Gouskova & Becker, 2013). This occasionally results in stems without an underlying vowel, to which no stress pattern can be assigned (these are also listed under ‘Other’). Four vowelless masculine nouns take the [u-] prepositional suffix and also constitute exceptions to our generalization: [lʲd-u] ‘ice (dat./prep. sg.)’, [lʲn-u] ‘flax (dat./prep. sg.)’, [lb-u] ‘forehead (dat./prep. sg.)’, and [mx-u] ‘moss (dat./prep. sg.)’. All in all, there are 14 exceptions to the prep.sg. ~ dat. sg. homophony avoidance generalization.

This generalization is not as robust as the nom. pl. ~ gen. sg. homophony avoidance in §3.1. Nevertheless, a Chi-Square test for independence performed on stress pattern and nominative plural suffix yields that the two are not independent ($p < .0001$, $df = 3$, $\chi^2 = 976$). Indeed, for 59 out of 73 nouns, the potentially homophonous [-u] suffix does not produce homophony in the paradigm.

In fact, it is surprising that the prepositional singular and dative singular are disambiguated at all. Unlike the nom. pl. ~ gen. sg. homophony avoidance, none of the regular stress patterns in §2 can disambiguate two singular forms prosodically. It is the exceptional nature of the [-u] prepositional singular suffix, the fact that it bears stress regardless of overall stress pattern, that allows for disambiguation through prosody to occur. As will be shown in the following section, this exceptional property can also be modelled as homophony avoidance.

3.3 Corpus Discussion

The two pairs of Russian homophonous suffixes discussed in this section produce very few homophonous forms in the paradigm. Often forms that carry the same inflectional suffix are distinguished prosodically: one of the homophonous suffixes bears stress, while the other does not. In situations with identical suffixes and identical stress assignment, one of the forms usually carries a suppleted stem. The nom. pl. ~ gen. sg. homophonous pair of suffixes yields only a single counterexample to this generalization. The prep. sg. ~ dat. sg. pair is less robust and yields fourteen counterexamples.

To account for the correlation of stress pattern and suffix, this paper pursues the idea that the language displays a bias towards contrast preservation within the morphological paradigm. *Ceteris paribus*, the choice of allomorph, stress pattern, and stem should not result in two forms with different underlying morphology and identical surface representation. More specifically, I assume that, just as in Trigrad Bulgarian (Crosswhite, 1999), stress, and not some other repair mechanism, is used to disambiguate potentially homophonous forms. Homophony avoidance will be modelled using the Optimality Theory framework (Prince & Smolensky, 2004).

Note that, given the results of the corpus study, markedness and faithfulness constraints alone cannot determine the winning candidate. Grammaticality in Russian masculine nominals must be influenced by other forms in the paradigm. Therefore, the OT framework employed must be able to generate a comparison set, members of which are compared to each candidate in the tableaux in accordance with specialized constraints. There are many examples of such frameworks in the literature (Steriade, 2000; Padgett, 2003; Lubowicz, 2012; Alderete, 2013).

This paper will follow the approach in Crosswhite (1999), which models the interaction of vowel reduction, stress shift, and homophony avoidance in Trigrad Bulgarian. Central to the data is the constraint Anti-Ident, adapted from Crosswhite (1999) and defined in (9), which assigns a violation for every form in the comparison set that does not differ from the candidate in some phonological property, be it segmental or prosodic. Anti-Ident is very similar to Anti-Faithfulness (Alderete, 2013), which is a constraint that encourages dissimilarity between a candidate and the underlying form or a selected base form. In principle, Anti-Faithfulness is able to model homophony avoidance, but only if the homophonous competitor is pre-selected as the base form. Contrariwise, Anti-Ident penalizes homophony directly and is, therefore, the more natural choice for this project.

(9) Anti-Ident: For each member of the comparison set, assign a violation if it does not differ from the candidate in some phonological property P.

Following Padgett & Ní Chiosáin (2020), this paper makes use of comparison sets, subsets of the lexicon relevant for comparison. Based on the results form the corpus study as well as previous findings (Baerman, 2010; Bethin, 2012; Pertsova, 2015; Kaplan & Muratani, 2015), the domain of homophony avoidance, and therefore the comparison set, appears to be the morphological

paradigm. However, note that evidence in favour of a broader, between-word homophony avoidance effects exists as well (Ogura & Wang, 2006; Silverman, 2009). For the purposes of this project, the comparison set will be limited to all forms in the morphological paradigm of the input. In fact, it will be limited further in §4.2.2 to exclude forms in the morphological paradigm not familiar to the speaker. However, since it can be assumed that the speaker is acquainted with the entire paradigm of the input, and that homophony between any forms in the paradigm is in violation of Anti-Ident. Therefore, to evaluate a tableau, every candidate must be compared with every form in the morphological paradigm. For Russian nominals, this means 11 comparisons per candidate (6 grammatical cases and two grammatical numbers, minus one since there is no sense in comparing a form to itself). However, for the purposes of exposition, only members of the comparison set that can influence the result of the derivation will be listed.

A second constraint, **P**aradigm **U**niformity, is required to explain the data, defined in (10) with some adjustments to the original (Steriade, 2000). Paradigm uniformity is the well-established preference for identical exponents for the same underlying morpheme (Kiparsky, 1978; Steriade, 2000; Do, 2018). This constraint assigns a violation for every form in the comparison set that shares a morpheme with the candidate but not its surface realization. I set the scope of this constraint to 'ALL', indicating that comparisons are to be made with the entire comparison set, i.e. the entire morphological paradigm. Adjusting the scope of the PU constraint will be crucial later in the analysis.

(10) PU(ALL): Assign a violation for every morpheme in the candidate that differs in some phonological feature between the candidate and a member of the comparison set.

In (11), we can see how a stress shift is motivated for the nominative plural of the mobile-stressed word [tom] 'tome', which takes the [-a] suffix. To ensure that homophony avoidance takes place, Anti-Ident >> PU(ALL). For clarity, the comparison set is listed alongside every tableau, rather than separately, as is done in Crosswhite (1999). Once again, assume that the comparison set contains all 11 other members of the /tom/ morphological paradigm. However, because we know that only the genitive singular can be homophonous, it is the only form included here.

In the tableau, stem-stressed Candidate (a) maintains paradigm uniformity, as it shares the exponent of the root /tom/ with a member of the comparison set. However, by the same token, Candidate (a) violates Anti-Ident since it is phonologically but not syntactically identical to the member of the comparison set. Contrariwise, suffix-stressed Candidate (b) violates PU(ALL) but not Anti-Ident. Because Anti-Ident is ranked higher than PU(ALL), Candidate (b) wins, and contrast is maintained.

(11) Stress Shift to Avoid Homophony in Real Words

[tom-a] (nom. pl.)	Anti-Ident	PU(ALL)
a. [ˈtom-a] (nom. pl.)	*!	
b. ☛ [toˈm-a] (nom. pl.)		*

Comparison Set:
[ˈtom-a] (gen. sg.)
…

It is important to note the accentual relation between the nominative plural and genitive singular is symmetric. Tableau (11) derives suffix stress in the nominative plural based on stem stress in the genitive singular in the comparison set. Just as easily, one could derive stem stress in the genitive singular based on suffix stress in the nominative plural. In fact, anti-homophony and paradigm uniformity can only define relations between morphologically related forms, they cannot evaluate a single candidate in isolation.

It is assumed that stress assignment for the form in the comparison set is derived either by constraints not relevant to this project or to simply be underlying. Likewise, it is assumed that contrast is not expressed through segmental means, such as deletion, epenthesis, etc., because of highly ranked faithfulness constraints, such as Max, or Dep. The purpose of this section is not to explain Russian stress and phonology in full, but simply to model its interactions with homophony avoidance. Russian accentuation, in particular, is a complicated topic and has already been addressed at length in the literature (Idsardi, 1992; Alderete, 2013; Osadcha, 2019).

Recall that stress assignment in the nominative plural and genitive singular can match in the language if the plural forms exhibit stem suppletion. This pattern is readily modelled with the same constraints. Observe the exceptional stem [kom] ‘lump’ in (12). While the genitive singular

of this stem [ˈkom-a] is perfectly regular, the plural forms exhibits an additional and irregular [j], as in the nominative plural [ˈkomj-a].[4]

Unlike in (11), stem-stressed Candidate (a) in (12) does not violate Anti-Ident with the genitive singular (or any other form) in the comparison set. Suffix-stressed Candidate (b) violates PU(ALL), something which was tolerated in (11) but not in (12). As a result, Candidate (a) is the winner, and the word exhibits a stable stress pattern.

(12) Lack of Stress Shift in Suppleted Stems

[komja] (nom. pl.)	Anti-Ident	PU(ALL)
a. ☛ [ˈkomja] (nom. pl.)		
b. [koˈmja] (nom. pl.)		*!

Comparison Set:
[ˈkoma] (gen. sg.)
…

The two constraints employed, Anti-Ident and PU(ALL), account for the difference in stress assignment between the genitive singular and nominative plural. To address the rest of the paradigm an additional constraint is necessary. Grammatical cases other than the genitive singular and nominative plural are unaffected by the Anti-Ident constraint, due to the lack of corresponding homophonous suffixes. Furthermore, PU(ALL) cannot choose a winning candidate, as there may be both stem-stressed and suffix-stressed forms in the comparison set. Without further constraints, it is unclear how stress would be assigned in say, the dative plural, which would violate PU(ALL) through comparison to the nominative plural if it is stem-stressed and through comparison to the genitive singular if it is suffix-stressed.

Recall that in actual Russian, stress within grammatical number is generally consistent but is not necessarily consistent between the two. I will use this as evidence for a narrower paradigm uniformity constraint PU(NUM), which is defined in (13). In essence, this is the same constraint as in (10) where only forms of matching grammatical number are taken into account. The assumption that Russian nouns have separate singular and plural inflectional bases is not

[4] An anonymous reviewer asks whether alterations in stem such as in [kom] ‘lump (sg.)’ vs [komj] ‘lum (pl.)’ are stored in the lexicon or themselves derived through homophony avoidance. Because stress appears to be the default disambiguation strategy in the language, and because it is impossible to predict the locus and nature of segmental alterations, I assume that differences between the singular and plural stems are underlying. Therefore, homophony avoidance does not determine which stems alternate; it simply does not induce a stress shift in forms that do.

exclusive to this paper and has been made previously (Zalizniak, 1985; Alderete, 2013; Pertsova, 2015).

(13) PU(NUM): Assign a violation for every morpheme in the candidate that differs in some phonological feature between the candidate and a member of the comparison set of the same grammatical number as the candidate.

In (14), we can see how a stress shift is motivated by this new constraint for the prepositional plural of the same word [tom] ‘tome’. For simplicity, only the genitive singular and nominative plural forms were included in the comparison set, as adding other forms would not affect the outcome. Neither candidate violates Anti-Ident. Both candidates violate PU(ALL), but, because PU(NUM) only cares about comparisons with other plural forms, it is violated for stem-stressed Candidate (a) but not suffix-stressed Candidate (b). Therefore, Candidate (b) is correctly chosen as the winner.

(14) Stress Shift to Preserve Uniformity in Real Words

[tom-ax] (dat. pl.)	Anti-Ident	PU(NUM)	PU(ALL)
a. [ˈtom-ax] (dat. pl.)		*!	*
b. ☛ [toˈm-ax] (dat. pl.)			*

C:
[ˈtom-a] (gen. sg.)
[toˈm-a] (nom. pl.)
…

For completeness, in (15) I model the prep. sg. ~ dat. sg. homophony avoidance using OT. No new constraints are required. The word [ˈlʲes] ‘forest’, which takes the [-u] prepositional singular suffix, is used as an example. For simplicity, only the competing dative singular form was included in the comparison set, as adding other forms would not affect the outcome. On the one hand, we see that stem-stressed Candidate (a) preserves paradigm uniformity with the member of the comparison set. As a result, Candidate (a) violates Anti-Ident. On the other hand, we see that suffix-stressed Candidate (b) violates both PU(ALL) and PU(NUM), as it does not match the stress placement of the member of the comparison set. However, Candidate (b) does not violate Anti-Ident. Candidate (b) is correctly chosen as the winner, and contrast is maintained.

(15) Exceptional Stress in OT

[lʲes-u] (prep. sg.)	Anti-Ident	PU(NUM)	PU(ALL)
a. [ˈlʲes-u] (prep. sg.)	*!		
b. ☛ [lʲeˈs-u] (prep. sg.)		*	*

C:
[ˈlʲes-u] (dat. sg.)
…

The ranking Anti-Ident >> PU(NUM), PU(ALL) predicts a language in which stress is consistent in the paradigm by default. However, for every pair of homophonous suffixes, stress is predicted to differ between the two forms. When the two forms differ in number, the singular forms will match the stress assignment of the singular competitor, the plural forms will match the stress assignment of the plural competitor. This is the case of the nom. pl. ~ gen. sg. homophony avoidance in Russian. When the two forms are of the same number, a mismatch in stress assignment within number will be tolerated. This is the case with the prep. sg. ~ dat. sg. homophony avoidance in Russian.

Once again, note that, while the three constraints employed are in line with the data presented in this section, there are alternative grammars that satisfy the same constraints. Therefore, other constraints are required to explain the particulars of Russian accentuation. For example, it is currently unclear why the language prefers stem stress in the singular and suffix stress in the plural and not *vice versa*, since both scenarios satisfy Anti-Ident and PU(NUM). Also, while PU(ALL) correctly gives preference to accentual paradigms that preserve the same stress pattern throughout the paradigm, the fact that stable stress is far more common than end stress remains unexplained. Because these details have no bearing on homophony avoidance, they will not be explored further.

It should also be acknowledged that, although the corpus presents evidence of two anti-homophony trends in masculine nominals, Russian is not devoid of homophony. The aforementioned homophony between the dative singular [-u] and secondary genitive singular [-u] is one instance of homophony within Russian masculine nouns that is tolerated. In fact, among feminine and neuter nouns, homophony between the nominative plural and genitive singular is commonplace, e.g. fem. [ˈkoʂk-i] ‘cat (nom. pl. / gen. sg.)’ and neut. [ˈblʲud-a] ‘dish (nom. pl. / gen. sg.); these are the same grammatical cases that exhibit such homophony avoidance in masculine nouns. Furthermore, note that at least one homophony avoidance trend involving the genitive plural and nominative singular suffixes has been found in feminine and neuter nouns

(Pertsova, 2015). Therefore, homophony avoidance is not exclusive to masculine forms nor to the combinations of case and number explored here. Furthermore, homophony avoidance is tolerated in masculine forms and in the combinations of case and number explored here. As such, it is unclear at this point how the locus of homophony avoidance is chosen in the language.

Assuming that the patterns discussed in this section are a result of homophony avoidance, observe an important asymmetry between (11) and (14). Stress shifts motivated by homophony avoidance, as in (11) and (15), require only a single form in the comparison set, the potentially homophonous competitor. Stress shifts motivated by paradigm uniformity, as in (14), require multiple forms in the comparison set, a form of the same grammatical number and a homophonous competitor, which itself determines the stress assignment on that form. In other words, the stress shift motivated by paradigm uniformity presupposes the stress shift motivated by homophony avoidance. The two kinds of stress shift require different amounts of data as motivation. This asymmetry will become crucial in the experimental design in §4.

A competing explanation, one that does not make reference to homophony avoidance, is possible. It could be the case that the patterns observed are random or resulting from diachronic impulses and that inflectional suffixes are stored in the lexicon along with information about the paradigm stress distribution. In such an account, the underlying representation of the nominative plural suffix [-a] must specify not only the stress placement in the nominative plural but also in other forms in the paradigm, specifically the singular, which always bears stress on the stem when the nominative plural suffix is [-a]; only so can one ensure the cooccurrence of the suffix with the mobile stress pattern. The same is true of the underlying representation of the prepositional singular [-u], which must store information about stress in other singular forms.

Importantly, in an account that does not make reference to homophony avoidance, there is nothing special about the link between the nom. pl. [-a] and the gen. sg. [-a]. The stress placement of one can be reliably predicted from the other, but this is true of any two forms in the paradigm. Given the form [toˈm-a] ‘tome (nom. pl.)’, one should be able to just as easily deduce the stress placement in [ˈtom-u] ‘tome (dat. sg.)’ or in [ˈtom-om] ‘tome (inst. sg.)’, even though these are not potentially homophonous. It should be noted that, in any case, simple storage cannot explain why words for which the nominative plural and genitive singular suffixes match in stress tend to have suppleted stems in the plural.

The following section presents a nonce-word experiment, the aim of which is to ascertain which of the two approaches is correct: homophony avoidance or projection from the lexicon. Additionally, the experiment was designed to illustrate that the patterns observed in the corpus are productive and active in the synchronic grammar of speakers.

4 Experiment

The experiment was a nonce-word task (Berko, 1958) conducted online with Russian speaking participants. Participants were tasked with assigning stress to the **target**, a nonce noun declined into one of the singular forms, after they have been shown the **prompt**, the same nonce noun in the nominative plural. The experiment was designed to see if stress assignment would be used as a disambiguation strategy in cases where the two morphologically different forms were potentially homophonous.

The experiment makes use of the nom. pl. ~ gen. sg. homophony avoidance pattern described in §3.1. By exposing participants to only a few forms of the paradigm, the experiment manipulated the effects of homophony avoidance and paradigm uniformity separately, thereby distinguishing between true homophony avoidance and corpus mimicry. See §4.2 for more detail.

4.1 Experiment Method

4.1.1 Participants

A total of 107 participants took part in this study. Data from 7 (6.5%) was removed due to a greater than 10% error rate (wrong target case choice). Participants were recruited through Russian social media, forums, and student unions and, upon completion, offered reimbursement of 300RUB (approx. 4.60USD at the time of the experiment). Demographic information was self-reported. 79 of the participants were female, 20 were male (1 undeclared). The mean age of participants was 25.6 (median 22; range 15-65).

In terms of birthplace, 40 of the participants were from the Moscow region, 9 from the Sverdlovsk region. The remaining participants varied greatly in place of birth. 95 participants reported Russia as their country of birth. 59 participants reported living in Moscow at the time of the experiment, and all but 9 reported living in Russia. 90 participants reported some knowledge of English, 28 some knowledge of German, and 21 some knowledge of French.

4.1.2 Stimuli

Two factors were manipulated in a 2 x 3 design: prompt suffix and target case. There were two experimental groups: the **exposed group** and the **unexposed group**. The groups shared the same fillers and most of the critical trials. However, only the exposed group was ever shown potentially homophonous prompt and target forms. Order in both groups was randomized by participant.

There were 72 items, 36 target and 36 filler. Each trial contained a unique nonce word. Nonce word stems were monosyllabic[5] and constructed stochastically by a bigram learning model trained on the GICR corpus (see Albright, 2009 for a description of the model). Nonce stems that sounded unnatural to the author were removed manually and replaced with newly generated ones. Nonce words in critical trials were always masculine and suffix-stressed in the prompt; nonce words in filler trials varied in gender (masc. ~ fem.) and prompt stress (suffix ~ stem).[6] Stems for the critical trials, in Russian orthography, as well as IPA, can be seen in Table 5.[7] The complete list of stimuli and conditions can be accessed at anmunlin.com/research/russian_homophony.

[5] An anonymous reviewer asks if stress pattern in the corpus is sensitive to syllable count and whether or not this can have a bearing on the result. Indeed, mobile stress is most common in monosyllabic stems in the corpus (though even monosyllabic stems are overwhelmingly stable stressed). However, because all nonce stems in the experiment were monosyllabic, a difference in the conditions cannot attributed to any correlation of stress pattern and syllable count.

[6] As an anonymous reviewer points out, feminine nouns in Russian can be either fall into the 1st declension, taking an overt [-a] suffix in the nom. sg., or into the 3rd declension, taking a null suffix in the nominative singular. Since masculine nouns in Russian always take a null suffix in the nom. sg., all feminine filler items were constructed to be of the 3rd declension, maintaining the same structure between critical trials and fillers.

[7] An anonymous reviewer points out that speakers may revert to phonologically similar real words when assigning stress nonce stems. Such a confound is especially difficult to avoid here due to the fact that there is a relatively small space of possible monosyllabic nonce stems. However, target case was assigned to trials randomly, and it is unlikely that chance could have skewed the results significantly.

Table 5: Nonce Stems Generated by Bigram Model for Critical Trials

Russian Orthography	IPA	Russian Orthography	IPA	Russian Orthography	IPA
пон	pon	еск	jesk	холт	xolt
пай	paj	врат	vrat	церст	t͡serst
гран	gran	нят	nʲat	дрой	droj
тлис	tlʲis	стец	stʲe͡ts	зрон	zron
гник	gnʲik	панц	pan͡ts	черк	t͡ɕerk
зорк	zork	перск	pʲersk	пруздʲ	pruzd
юст	just	блак	blak	тляр	tlʲar
птень	ptʲenʲ	ук	uk	швон	ʂvon
жов	ʐov	рист	rʲist	блест	blʲest
чах	t͡ɕax	орн	orn	змер	zmʲer
осх	osx	рвел	rvʲel	ховд	xovd
ин	in	плент	plʲent	щан	ɕan

4.1.2.1 Exposure Group

Participants were split at random into two groups. During the experiment, the exposed group was occasionally given potentially homophonous combinations of prompt and target. The unexposed group acted as a control and was never given potentially homophonous combinations of prompt and target. The task for both groups was to assign stress to the target form.

The target for the exposed group varied between the dative singular, the instrumental singular, and genitive singular. Recall that the latter is potentially homophonous with the nominative plural prompt. The target for the unexposed group varied between the dative singular, the instrumental singular, and the prepositional singular. None of the target forms for the unexposed group could be homophonous with the prompt.

4.1.2.2 Prompt Suffix

The prompt was always the nominative plural form of the same noun as the target. In critical trials, the prompt always bore suffix stress. Because stress assignment for the plural forms was predetermined (recall that stress is generally consistent within plural and singular forms but not between the two), participants, by assigning stress to the singular target, were choosing between an end stress pattern (suffix stress on the target) and a mobile stress pattern (stem stress on the target).

For critical items, the prompt varied between the two available nominative plural suffixes: [-i] which is not homophonous with any singular form, and [-a] which is potentially homophonous with the genitive singular. For filler items, the nominative plural suffix was always [-i]. The distribution of critical items by prompt, target and group is given in Table 6.

Table 6: Number of Critical Items by Factor

	Exposed		Unexposed	
target case	-i	-a	-i	-a
gen.	6	**6**	--	--
dat.	6	6	6	6
instr.	6	6	6	6
prep.	--	--	6	6

Critical trials with potential homophony between the prompt and target constituted 1/12 of all trials for the exposed group (bolded in Table 6), while the unexposed group did not see any such trials at all. The large number of non-homophonous trials and fillers was added to obfuscate the purpose of the experiment and avoid eliciting any prescriptive notions about contrast and stress.

4.1.3 Procedure

The experiment was conducted online and in Russian. All participants provided written consent to participate in the experiment.

The stimulus consisted of three sentences, presented orthographically and auditorily at the same time. Recordings were pronounced by a male native speaker of Russian in his late 40s, born in Moldavian SSR and residing in Canada for the last 18 years. The end of each recording triggered the beginning of the next sentence stimulus. The orthographic transcription of each sentence remained on-screen for the remainder of the trial. A unique illustration of a fictional animal, designed by an artist for this experiment (Gerassimov, 2021), was displayed throughout the trial.

The first sentence was of the form “This is N+Adj”. The sentence presented a unique nonce word N followed by and agreeing with a unique and real adjective. Recall that the homophony avoidance pattern is exclusive to masculine nouns. The first sentence was included to introduce the gender of the nonce word to the participant. The same nonce stem would be used in the remainder of the trial. The second sentence presented the prompt form, i.e. the nominative plural

of the nonce word. The third sentence contained a blank space, or silence in the recording, corresponding to the target form, i.e. the nonce word declined into one of the singular cases.

After the final recording finished playing, a multiple-choice question appeared on the screen, in which participants were asked to fill in the gap in the last sentence. Two of the answers bore a case ending compatible with the sentence gap, two of the answers bore a real but contextually illicit case ending. For both the felicitous and infelicitous answers, participants had to choose between a form with stress on the stem and a form with stress on the suffix. The order of answers was randomized by trial. Answers were presented orthographically, with stress marked with an acute accent (á), the standard stress mark in Russian. A sample trial is shown in Figure 2.

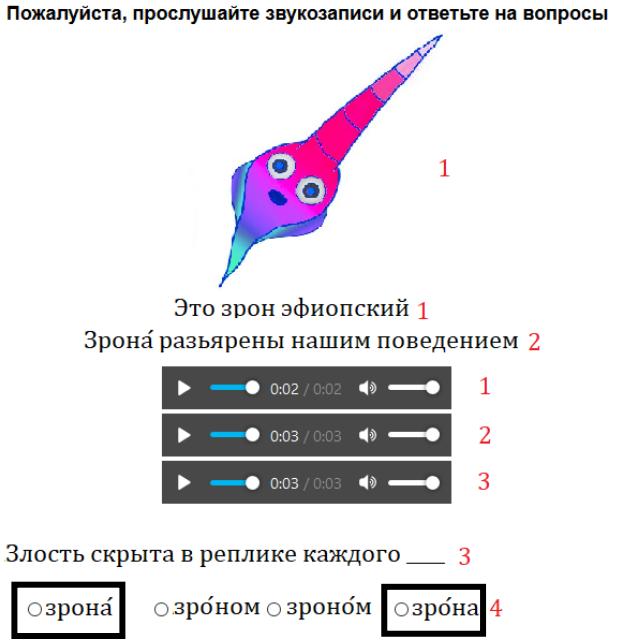

Figure 2: Sample experimental trial.

> Translation: ‘Please listen to the recordings and answer the questions. This is an Ethiopian [zron]. [zroˈna] are infuriated by our behaviour. Anger is concealed in the statement of every ____ (intended [zrona]).’
>
> The numbers, representing the order in which the items appeared on screen; and the bold outline, highlighting the felicitous answers, were not present in the original experiment and are included for exposition.

Illustrations, contexts for the second and third sentences, and adjectives in the first sentence varied by trial. For greater immersion, the context sentences were linked thematically and engaged with the illustration where possible. Each sentence was accompanied by a play button,

allowing participants to listen to the recordings more than once. The trial ended once the 'Next' button was clicked.

4.2 Predictions

Table 7 contains the nominative plural suffix and singular target stress assignment combinations possible in the experiment. Frequency, according to the corpus study in §3, by nominative plural suffix is also provided. Participants' response, i.e. stress assignment in the target, is bolded. Recall that the combination of suffix stress in the plural and stem stress in the singular (mobile stress) is extremely rare in the corpus when the nom. pl. suffix is [-i], whereas the combination of suffix stress in the plural and suffix stress in the singular (end stress) is extremely rare in the corpus when the nom. pl. suffix is [-a].

Table 7: Possible Combinations of Stress Pattern and Nom. Pl. for Critical Trials

Corpus Frequency	11.2%	1.3%	1.0%	69.5%
Prompt Suffix	-í	-í	-á	-á
Prompt Stress	suffix	suffix	suffix	suffix
Target Stress	**suffix**	**stem**	**suffix**	**stem**

4.2.1 Projection from the Lexicon

The baseline hypothesis of the experiment is that participants will simply mimic the patterns observed in the corpus. This hypothesis is compatible with the idea that homophony avoidance is diachronic and emergent (Mondon, 2010; Blevins & Wedel, 2009).

If speakers simply memorize the distributions of stress and suffix, then, as per Table 7, trials with [-a] as the prompt suffix should elicit a greater proportion of stem stress on the target, while trials with [-i] as the prompt suffix should elicit a greater proportion of suffix stress. Crucially, these are the expectations regardless of the grammatical case of the target, as the corpus pattern is independent of grammatical case. In other words, this account predicts an effect of prompt suffix on the dependent variable, but no effect of target case or any interaction thereof.

No difference between exposure groups is predicted under this approach. The potentially homophonous prompt ~ target pairs occasionally given to the exposed group are not predicted to behave any differently from non-homophonous pairs. Like the exposed group, the unexposed

control group is predicted to display an association between the [-a] nom. pl. and mobile stress and between the [-i] nom. pl. suffix and end stress.

4.2.2 Homophony Avoidance

The alternative hypothesis is that participants' answers will be motivated by homophony avoidance. We can model the precise predictions of this hypothesis in OT. The central assumption of the experimental design is that the comparison set can only contain forms which have been witnessed previously. As all of the items in this experiment are nonce words, the comparison set is limited to the one form previously given to the participant: the prompt.

Under this approach, the stress assignment of the genitive singular target in combination with a prompt bearing the [-a] nom. pl. suffix is predicted to behave like real words in the corpus, as modelled in (16) for the nonce stem [zron]. Due to the presence of the nominative plural prompt in the comparison set, the suffix-stressed Candidate (b) violates Anti-Ident, and Candidate (a) is the winner.

(16) Stress Shift to Avoid Homophony in Nonce Words

[zron-a] (gen. sg.)	Anti-Ident	PU(NUM)	PU(ALL)
a. ☛ [ˈzron-a] (gen. sg.)			*
b. [zroˈn-a] (gen. sg.)	*!		

Comparison Set: [zroˈn-a] (nom. pl.)

However, contrast this to a dative singular target in combination with the [-a] prompt, as in the nonce stem [rʲist] in (17). This input is predicted to behave differently from the stem in (15), and indeed from real words in the corpus, cf. (14).

(17) Stress Shift to Preserve Uniformity in Nonce Words

[rʲist-u] (dat. sg.)	Anti-Ident	PU(NUM)	PU(ALL)
a. [ˈrʲist-u] (dat. sg.)			*!
b. ☛ [rʲiˈst-u] (dat. sg.)			

Comparison Set: [rʲiˈst-a] (nom. pl.)

Because the potentially homophonous genitive singular form was not made available to the participants, it did not incur a violation of Anti-Ident and bear stem stress as a result. Without a stem-stressed genitive singular form in the comparison set, there is no violation of PU(NUM) for

the dative singular and no motivation for stem stress in the singular. In fact, unlike real words, the experimental items cannot incur a violation of PU(NUM), as participants are only ever shown one form in the singular and one form in the plural. Note that tableaux of trials bearing the /-i/ nom. pl. suffix are similar to (17), as these too cannot violate either Anti-Ident or PU(NUM).

Therefore, under the homophony avoidance hypothesis, stress assignment is predicted to be asymmetric in regard to target case. For trials where the prompt bears the [-a] suffix and the target case is genitive, a greater proportion of stem stress on the target (mobile stress) is predicted. Yet, contrary to patterns observed in the corpus, for trials where the prompt bears the [-a] suffix and the target case is not genitive, a greater proportion of suffix stress on the target (end stress) is predicted. In other words, a homophony avoidance account predicts an effect of the interaction of prompt suffix and target case on the dependent variable, but no simple effects of either.

Under this approach, the two groups should behave differently. The unexposed group is not predicted to exhibit any effect, despite the fact that the nom. pl. suffix and stress pattern are correlated in the corpus.

4.3 Experiment Results

4.3.1 Descriptive Patterns

The 100 participants each contributed 36 critical items and 36 fillers. Errors due to infelicitous target case choice (N = 88) were removed from the analysis. There were 46 participants in the exposed group and 54 in the unexposed group. The distribution between exposed and unexposed groups was uneven because the study was conducted online without human intervention. Therefore, hereafter results will be presented as proportions and not counts.

As can be seen in Figure 3, participants preferred to keep stress on the suffix, with only 38.6% of overall responses corresponding to stem stress in the target and, therefore, a mobile stress pattern. This asymmetry is expected, since end stress is far more common than mobile stress, as found in §3.

For all three target cases, an [-a] prompt suffix elicited a greater proportion of mobile stress assignment. The difference in prompt suffix was most pronounced in the genitive target, with genitive target eliciting 37.7% mobile stress responses with the [-i] prompt suffix and 62.8% mobile stress responses with the [-a] prompt suffix. In fact, the combination of [-a] prompt suffix and genitive singular target case was the only one which elicited a mobile stress response more than half of the time. For instrumental targets, trials with the [-a] prompt suffix still elicited a notable increase in mobile stress proportion, from 27.1% to 38.0%. For dative targets, the effect was in the same direction but very slight, from 36.2% mobile stress with the [-i] suffix to 42.2% in the [-a] suffix.

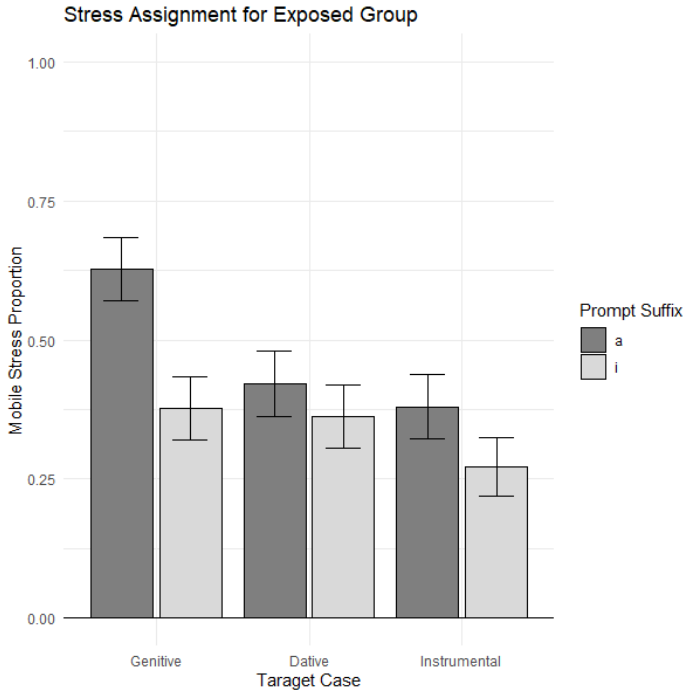

Figure 3: Proportion of target stem stress (mobile stress pattern) responses by target case and prompt suffix, aggregated across participants in the exposed group (N = 46). Whiskers span a 95% confidence interval, calculated as 1.96 * Standard Error.

For the unexposed group, as can be seen in Figure 4, the differences are less pronounced. No combination of prompt suffix and target case elicited a greater than 50% proportion of mobile stress. For instrumental and dative target cases, as for the exposed group, the [-a] prompt suffix elicited an increase in mobile stress responses: from 28.3% to 35.7% in the instrumental target

and from 38.7% to 42,9% in the dative target. However, for the prepositional singular, which was not given to the exposed group, the difference was miniscule and in the opposite direction, with the [-a] prompt suffix eliciting a mobile stress response 37.2% of the time and the [-i] prompt suffix 38.3%.

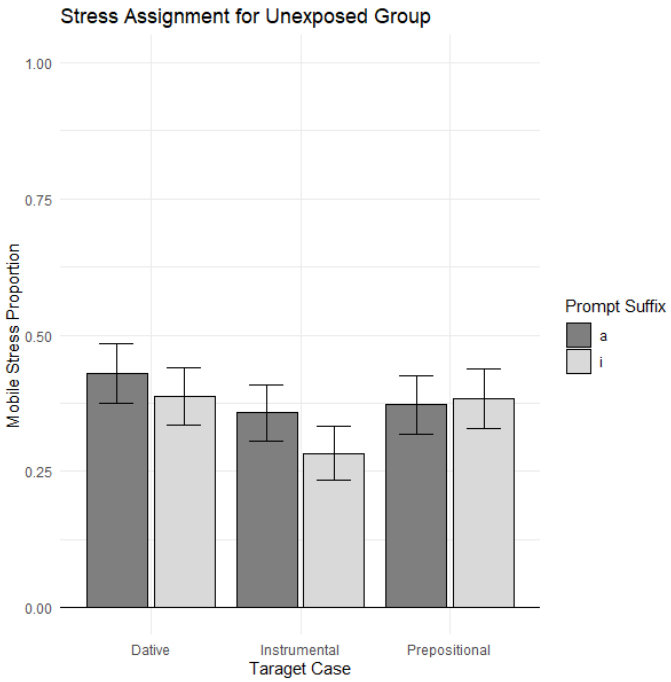

Figure 4: Proportion of target stem stress (mobile stress pattern) responses by target case and prompt suffix, aggregated across participants in the exposed group (N = 54). Whiskers span a 95% confidence interval, calculated as 1.96 * Standard Error.

The initial results seem to point to a slight effect of prompt suffix on stress assignment and a staggering effect of prompt suffix in the genitive target in particular. For both trends, the effect is in the expected direction, with the [-a] nominative plural suffix eliciting a greater proportion of mobile stress responses. The slight overall effect of prompt suffix is in line with the projection from the corpus hypothesis. The large effect in the genitive singular target is in line with the homophony avoidance hypothesis.

4.3.2 Inferential Statistics

To determine if the observed trends were statistically significant, a logistic regression model was run in *R* (R Development Core Team, 2019) using the *lme4* package (Bates et al., 2015). The analyzed data consisted of critical items only, with errors (N = 88) removed. The dependent variable was target stress assignment (reference level = end stress). The independent variables were target case (reference level = genitive) and prompt suffix (reference level = [-i]); both were simple coded. Participant and item were included as random effects. By-suffix slope per participant was also included in the model. To ensure model convergence, all other random effect slopes were omitted. Models for the exposed group and unexposed groups were run separately, due to the non-isomorphic distribution of target case between them. The model formula was as follows:[8]

stress ~ suffix * case + (suffix | participant) + (1|item)

Results from the exposed group model are presented in Table 8.

Table 8: Results of Logistic Regression Model for Exposed Group

	Estimate	Std. Error	z-value	Pr(>|z|)	
Intercept	-0.72404	0.35110	-2.062	0.039	*
Case(Dative)	-0.08019	0.36561	-0.219	0.826	
Case(Instrumental)	-0.75072	0.37394	-2.008	0.045	*
Suffix(a)	1.51731	0.41996	3.613	<0.001	***
Case(Dative): Suffix(a)	-1.31096	0.52688	-2.488	0.013	*
Case(Instrumental): Suffix(a)	-0.96073	0.53340	-1.801	0.072	.

Positive estimates correspond to an increase in mobile stress probability in the target and negative estimates correspond to an increase in end stress probability. The difference between genitive and instrumental case was significant, with more mobile stress for genitive targets than for instrumental targets. Suffix choice for the reference level (genitive) was found to be highly significant, with more mobile stress for [-a] suffix prompts than for [-i] suffix prompts. Finally,

[8] An anonymous review suggests checking if dialectal variation in stress assignment has influenced the results. As such, participants were split into two categories by place of birth: those born in Moscow (N= 13/46 for exposed group, N = 24/54 for unexposed group), those not born in Moscow. However, this binary place of birth factor did not come out as significant and was, therefore, omitted.

the interaction between prompt suffix and target case was significantly different between genitive and dative targets, but not between genitive and instrumental targets.

The results of the model indicate a significant effect of suffix. However, it is important to differentiate between an overall effect of prompt suffix and an effect of the suffix in the reference level. As such, a *post hoc* test on the model interactions was run using the *phia* package (De Rosario-Martinez et al., 2015). Target case was set as a fixed comparison, while prompt suffix was set as the pairwise comparison. Results of the interaction test can be viewed in Table 9. The difference between [-i] suffix prompts and [-a] suffix prompts was significant for genitive targets but not significant for dative and instrumental targets. Therefore, an across the board effect of prompt suffix is unsubstantiated. I conclude that the [-a] prompt suffix elicited an increase in mobile stress assignment in genitive targets but not anywhere else.

Table 9: Results of Interaction Test for the Exposed Group Model

		Value	Df	Chisq	Pr(>Chisq)	
i-a	Genitive	0.17986	1	13.0533	.001	***
i-a	Dative	0.44860	1	0.2419	.623	
i-a	Instrumental	0.36434	1	1.6882	.388	

Each trial, i.e. each combination of item and participant, was assigned a log odds of receiving a stem response based on model coefficients using the *predict()* function in R. The log odds were converted to probabilities and used to analyze individual differences between participants, as shown in Figure 5. The figure shows the likelihood of a mobile stress response per participant in the exposed group (N = 46) plotted by prompt suffix and target case. There was considerable individual variation in responses. Some participants strongly preferred end stress for all items, some participants strongly preferred mobile stress for all items. However, for 44/46 participants in the exposed group there was an increase in likelihood of mobile stress when going from the [-i] suffix to the [-a] suffix in the genitive target, corresponding to a higher probability of mobile stress responses in the potentially homophonous combination of target and prompt.

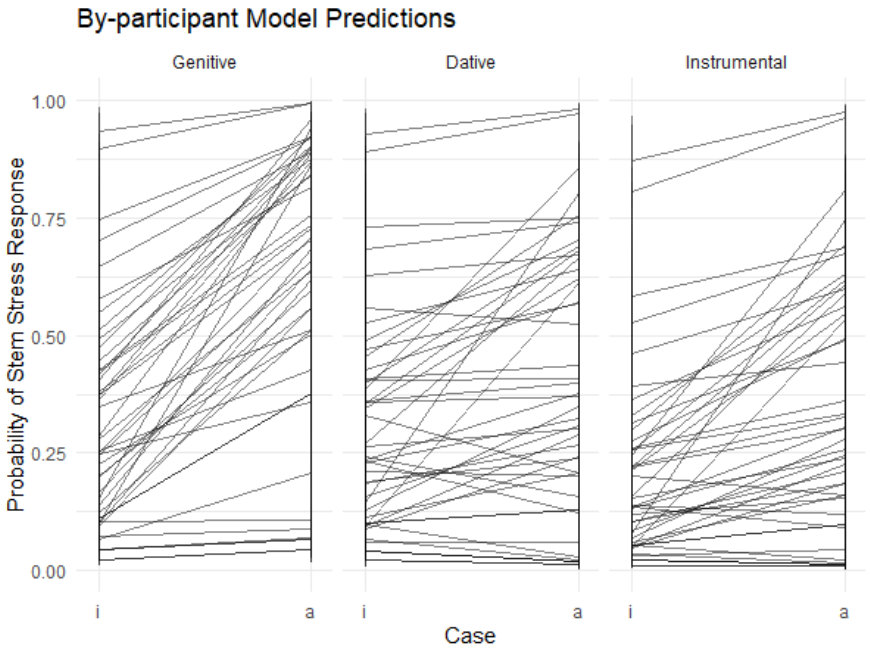

Figure 5: Model predictions for individual participants in the exposed group by target case and prompt suffix. The y-axis represents the predicted probability of choosing a stem response. Each line segment corresponds to a participant (N = 46).

Results from the logistic regression model for the unexposed control group are presented in Table 10. No main effect or interaction was found to be significant for the unexposed group.

Table 10: Results of Logistic Regression Model for Unexposed Group

	Estimate	Std. Error	z-value	Pr(>|z|)	
Intercept	-0.80834	0.39199	-2.062	0.039	**
Case(Dative)	0.04461	0.39741	0.112	0.911	
Case(Instrumental)	-0.77416	0.40567	-1.908	0.056	.
Suffix(a)	-0.01552	0.42243	-0.037	0.971	
Case(Dative): Suffix(a)	0.31540	0.56145	0.562	0.574	
Case(Instrumental): Suffix(a)	0.68232	0.56759	1.202	0.229	

The experimental results are in support of the homophony avoidance hypothesis. Participants who were exposed to potential homophony were significantly more likely to assign a mobile stress to the target when doing so would disambiguate it from the prompt. In other words, participants had acquired the association between the [-a] nom. pl. suffix and singular stem stress assignment in the genitive case, but not the dative or instrumental, despite all three cases exhibiting the same pattern in the corpus. The results can be observed in 44/46 participants in the

exposed group. Participants who were not exposed to potential homophony displayed no significant effect.

5 General Discussion and Conclusion

It is important to once again highlight that the experiment results cannot be predicted simply based on corpus trends. As discussed in §3.1, in the Russian corpus a stressed nominative plural [-a] corresponds to a mobile stress pattern (in all words but one), i.e. stem stress in the singular and suffix stress in the plural. Therefore, based on corpus trends alone, when given a nominative plural form like [zroˈn-a], participants are expected consistently assign stem stress to any singular form, such as the dative singular [zron-u]. However, this was not observed in experiment. Instead, participants overwhelmingly assigned stem stress to a singular form when doing so would disambiguate it from the prompt but maintained suffix stress elsewhere.

As shown in §3.3 and §4.2.2, the same association of the [-a] nominative plural and a mobile stress pattern can be modelled in OT, as a combination of homophony avoidance (Anti-Ident), which ensures that the nominative plural and genitive singular have differing stress, and paradigm uniformity, which ensures that singular forms mimic the stress of the genitive singular while plural forms mimic the stress of the nominative plural. The experiment, which did not provide participants with any singular form except for the target, bypassed paradigm uniformity entirely. Thus, without relevant members in the comparison set, only a homophony avoidance effect could be manifested. The use of nonce words in the experiment was crucial. Contrary to nonce words, real words are expected to be affected by paradigm uniformity, as the entire inflectional paradigm is familiar to the speaker.

Because a diachronic and emergent mechanism for homophony avoidance is well-established in the literature (Mondon, 2010; Blevins & Wedel, 2009) and because speakers are able to extend trends found in the lexicon to novel words, any faithful projection of corpus patterns to nonce data is insufficient argumentation for synchronic homophony avoidance. A homophony avoidance pattern could have emerged in the language due to errors in transmission, and speakers could have faithfully internalized the pattern, as an association between elements and not as an active restriction. To reliably measure a synchronic homophony avoidance effect, one must induce homophony avoidance behaviour not found in the language, such as by using nonce

words. To do so, one needs a language where the behaviour of real words is determined by homophony avoidance and another factor, as well as an experiment where the effects of this other factor can be isolated. Russian is such a case. Due to the interaction of homophony avoidance and paradigm uniformity in the grammar, in certain constructed situation, speakers of Russian displayed biases not found in their language. While the experimental paradigm presented in this paper may in theory be extended to other cases of alleged homophony avoidance, to adequately demonstrate that a homophony avoidance generalization is synchronic and not diachronic, the interaction of homophony avoidance and another factor is needed. Without such an interaction, any results are ambiguous, as they can just as easily be ascribed to a combination of diachronic homophony avoidance and pattern learning.

Technically speaking, results from the experiment only show that speakers of Russian can shift stress in the genitive singular to avoid homophony with the nominative plural. The reverse, i.e. a shift in the nominative plural to avoid homophony with the genitive singular, was not demonstrated experimentally. This is an artifact of the experimental design rather than an insight into Russian phonology. It would simply be inconvenient if the nominative plural was the target form, as the [-a] allomorph of interest is rare in the language, and difficult to elicit. However, there is no reason to assume that speakers are unable to apply homophony avoidance in both directions.

In fact, evidence from diachrony seems to imply that it is the nominative plural that undergoes the shift to avoid homophony with the genitive singular, as in (11) and (13). Recall that many forms with mobile stress and the [-a] nominative plural used to have stable stress and the [-i] nominative plural, cf. modern Russian [toˈm-a] and archaic Russian [ˈtom-i] ‘tomes (nom. pl.)’. Therefore, historically the singular paradigm remained unchanged, while the plural forms underwent a shift from stem-stressed to suffix-stressed. This is the reverse direction from the one tested in the experiment. If the historical progression in the language is a reliable indicator of the synchronic homophony avoidance mechanism, then the experiment further demonstrates that speakers are able to generalize the mechanism and apply homophony avoidance in the opposite direction as well.

More broadly, the experiment results indicate that the synchronic homophony avoidance effect is not only present and productive in the language, but that it is also salient enough to be extended

to nonce words. Previous results have shown that natural or phonologically motivated generalizations observed in the lexicon are more likely to be extended to nonce words (Becker et al., 2011; Hayes & White, 2013). Therefore, at the very least the findings of this project suggest that homophony avoidance should be considered a typologically natural phenomenon.

Tangential to homophony avoidance but crucial to the experiment design is the secondary finding that the comparison set, at least when it comes to homophony avoidance, is limited to forms that are familiar to the speaker. It is not the case that, after witnessing a single form, the speaker populates the comparison set with the entire inflectional paradigm of that form.

Therefore, there is no evidence to suggest that the comparison set for Anti-Ident can be greater than the inflectional paradigm, at least when it comes to synchronic homophony avoidance. Frameworks dealing with contrast more generally, such as Preserve Contrast theory (Lubowicz, 2012; Lubowicz, 2016), utilize broader comparison sets, even those containing nonce stems themselves. However, because the OT modelling in §3.3 and §4.2.2 impose a strict limit on the comparison set, and because other literature on homophony avoidance also finds that the phenomenon is limited to the inflectional paradigm (Baerman, 2010; Bethin, 2012; Pertsova, 2015; Kaplan & Muratani, 2015), I conclude that homophony avoidance has a narrower scope in the grammar than in contrast preservation more generally. Frameworks that deal with contrast in other domains, such as Dispersion Theory (Flemming, 1995; Ní Chiosáin & Padgett, 2020) and Preserve Contrast Theory (Lubowicz, 2016), although they differ from the current study in empirical coverage, also suggest the existence of a synchronic contrast preservation mechanism, and are, therefore, complementary rather than contradictory to this study.

This paper introduces a pattern of homophony avoidance in the Russian nominal paradigm which must be attributed a synchronic restriction against homophony. The existence of a synchronic anti-homophony constraint has been previously regarded as unsubstantiated (King, 1967; Kaplan & Muratani, 2009; Mondon, 2009; Sampson, 2013). I believe the main reason for the skepticism is the well-established framework for diachronic homophony avoidance and the lack of clear method of distinguishing between diachronically emergent contrast preservation and a synchronic anti-homophony constraint. This paper shows that not only is synchronic homophony avoidance possible, but, given the right circumstances, it can be discriminated from emergent patterns experimentally. The paradigm presented here may prove useful in testing similar

phenomena in other languages, and the hope is that more instances of synchronic homophony avoidance will be uncovered in the future. These findings contribute to the understanding of phonological and morphological grammar in general, and they may also be useful to the study of Russian in particular.

6 References

Albright, Adam (2009). Feature-based generalisation as a source of gradient acceptability. *Phonology, 26*(1), 9-41. doi:10.1017/S0952675709001705

Alderete, John (2013). Morphologically governed accent in optimality theory. Routledge.

Baerman, Mathew (2010). Defectiveness and homophony avoidance. *Journal of Linguistics, 47*(1), 1-29. doi:10.1017/s0022226710000022

Bates, Douglas, Martin Machler, Ben Bolker & Steve Walker (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*, 67(1), 1-48. doi:10.18637/jss.v067.i01

Becker, Michael, Nihan Ketrez & Andrew Nevins (2011). The surfeit of the stimulus: analytic biases filter lexical statistics in Turkish laryngeal alternations. Lg 87. 84–125.

Berko, Jean (1958). The child's learning of English morphology. Word 14. 150–177.

Belikov, Vladimir, Nikolay Kopylov, Alexander Piperski, Vladimir Selegey & Serge Sharoff (2013). Corpus as language: From scalability to register variation. *Proc Dialogue, Russian International Conference on Computational Linguistics*.

Belikov, Vladimir, Nikolay Kopylov, Alexander Piperski, Vladimir Selegey & Serge Sharoff (2013). Big and diverse is beautiful: A large corpus of Russian to study linguistic variation. *Web as Corpus Workshop*.

Bethin, Christina (2012). Effects of vowel reduction on Russian and Belarusian inflectional morphology. *Lingua, 122*(11), 1232-1251. doi:10.1016/j.lingua.2012.06.004

Blevins, Juliette, & Wedel, Andrew (2009). Inhibited sound change. *Diachronica, 26*(2), 143-183. doi:10.1075/dia.26.2.01ble

Campbell, Lyle (2013). *Historical linguistics: An introduction*. Cambridge, MA: MIT Press.

Coats, Herbert (1976). *Stress assignment in Russian* (Vol. 1). Linguistic Research.

Crosswhite, Katherine (1999). Intra-Paradigmatic Homophony Avoidance in two Dialects of Slavic. *UCLA Working Papers in Linguistics, 1*(3), 48-67.

De Rosario Martinez, Helios, John Fox & R Core Team (2015). *Phia: Post-Hoc Interaction Analysis*.

Do, Youngah (2018). Paradigm uniformity bias in the learning of Korean verbal inflections. *Phonology, 35*(4), 547-575. doi:10.1017/s0952675718000209

Fedianina, Nina (1982). Udarenie v sovremennom russkom jazyke. Russkij Jazyk.

Flemming, Edward (2017). Dispersion Theory and Phonology. *Oxford Research Encyclopedia of Linguistics*. doi:10.1093/acrefore/9780199384655.013.110

Gerassimov, Alexandr (2020). Retrieved from shorturl.at/acuE9

Gouskova, Maria & Michael Becker (2013). Nonce words show that Russian yer alternations are governed by the grammar. *Natural Language and Linguistic Theory, 31*(3), 753-765. doi: 10.1007/s11049-013-9197-5

Gessner, Suzanne, & Gunnar Hansson (2004). Anti-Homophony Effects in Dakelh (Carrier) Valence Morphology. *Annual Meeting of the Berkeley Linguistics Society, 30*(1), 93. doi:10.3765/bls.v30i1.920

Halle, Morris. (1995). Stress Placement in Russian Nouns. O Rus! Studia Litteraria Slavic in Honorem Hugh McLean, 106-115.

Hayes, Bruse. & James White (2013). Phonological naturalness and phonotactic learning. LI 44. 45–75.

Ichimura, Larry (2006). *Anti-homophony blocking and its productivity in transparadigmatic relations*. Boston University.

Idsardi, William (1992). *The computation of prosody*. Massachusetts Institute of Technology.

Kaplan, Abby & Yuka Muratani (2015). Categorical and gradient homophony avoidance: Evidence from Japanese. *Laboratory Phonology, 6*(2). doi:10.1515/lp-2015-0006

King, Robert (1967). A Measure for Functional Load. *Studia Linguistica, 21*(1), 1-14. doi:10.1111/j.1467-9582.1967.tb00545.x

Kiparsky, Paul (1978). Chapter 11. Analogical Change as a Problem for Linguistic Theory. *Explanation in Phonology*. doi:10.1515/9783111666242.217

Kroch, Anthony (1989). Function and grammar in the history of English. *Language Change and Variation Current Issues in Linguistic Theory,* 133. doi:10.1075/cilt.52.09kro

Krysin, Leonid (1974). Russkij jazyk po dannym massovogo obsledovanija: Opyt social′no-lingvističeskogo izučenija. Nauka.

Labov, Wiliam (1994). *Internal factors*. Blackwell Publishers.

Lagerberg, Robert (2011). Variation and frequency in Russian word stress. Verlag Otto Sagner.

Łubowicz, Anna (2012). *The phonology of contrast*. Equinox.

Łubowicz, Anna (2016). Contrast preservation in Polish Palatalization. *Glossa: A Journal of General Linguistics*, 1(1), 21. doi:10.5334/gjgl.63

Martinet, André. (1955). *Économie des changements phonétiques: Traité de phonologie diachronique*. Francke.

Mondon, Jean-François (2009). *The nature of homophony and its effects on diachrony and synchrony*. University of Pennsylvania.

Mondon, Jean-François (2010). A Reassessment of Anti-Homophony in Bulgarian. *University of Pennsylvania Working Papers in Linguistics, 16*(1).

Ogura, Mieko & William Wang (2018). Evolution of Homophones and Syntactic Categories Noun and Verb. *Proceedings of the 12th International Conference on the Evolution of Language (Evolang12)*. doi:10.12775/3991-1.086

Osadcha, Irina (2019). *Lexical Stress in East Slavic: Variation in Space and Time*. University of Toronto.

Padgett, Jaye (2003). Contrast and post-velar fronting in Russian. *Natural Language and Linguistic Theory, 21*(1), 39-87. doi:10.1023/a:1021879906505

Padgett, Jaye, & Máire Ní Chiosáin (2020). Contrast, Comparison Sets, and the Perceptual Space. *Phonology at Santa Cruz, 7*.

Paster, Mary (2012). The role of homophony avoidance in morphology: A case study from Mixtec. *Proceedings of the 13th Annual Workshop on American Indian Languages* (2010). *Santa Barbara Papers in Linguistics* 21, 29-39

Pertsova, Katya (2015). Interaction of morphological and phonological markedness in Russian genitive plural allomorphy. *Morphology, 25*(2), 229-266. doi:10.1007/s11525-015-9256-1

Pocheville, Arnaud (2014). The Ecological Niche: History and Recent Controversies. *Handbook of Evolutionary Thinking in the Sciences,* 547-586. doi:10.1007/978-94-017-9014-7_26

R Core Team (2019). *R: A Language and Environment for Statistical Computing.* R Foundation for Statistical Computing

Riggs, Daylen. (2007). *Contrast Preservation in the Yupik languages*. Proceedings of the Western Conference on Linguistics, 37, 217-234.

Sampson, George (2013). A counterexample to homophony avoidance. *Diachronica, 30*(4), 579-591. doi:10.1075/dia.30.4.05sam

Shakhmatov, Aleksey. (1957). Istoričeskaja morfologija russkogo jazyka. Učpedgiz.

Sharapova, Elizabeth Marklund. Implicit and explicit norm in contemporary Russian verbal stress. Acta Universitatis Upsaliensis.

Shtudiner, Mikhail (2016). *Словарь трудностей русского языка для работников СМИ*. Slovari XXI.

Silverman, Daniel (2009). Neutralization and Anti-Homophony in Korean. *Journal of Linguistics*, 46(2), 453–482, doi:10.1017/s0022226709990247.

Steriade, Donca (2000). Paradigm uniformity and the phonetics-phonology boundary. *Papers in Laboratory Phonology, 5*, 313-334.

Stojkov, Stojko (1963). Akane v govora na s. Trigrad, Devinsko. *Bulgarski Ezik, 13*(1).

Timberlake, Alan (2004). A reference grammar of Russian. Cambridge University Press.

Winter, Bodo & Andrew Wedel (2016). The Co-evolution of Speech and the Lexicon: The Interaction of Functional Pressures, Redundancy, and Category Variation. *Topics in Cognitive Science, 8*(2), 503-513. doi:10.1111/tops.12202

Yanovich, Elena (1986). Istoričeskaia grammatika russkogo jazyka. Universiteckoe.

Yin, Sora & James White (2018). Neutralization and homophony avoidance in phonological learning. *Cognition, 179*, 89-101. doi:10.1016/j.cognition.2018.05.023

Zaliznyak, Andrey (1985). Ot praslavjanskoj akcentuacii k russkoj. Nauka.