

**Age Differences Between Speakers with Regards to Neutral Vowels in Hungarian Vowel
Harmony**

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Abstract

Neutral vowels in Hungarian vowel harmony have been the topic of substantial research. In her dissertation, Forró (2013) claims that there has been an increase in stems that take a front suffix, and that this could potentially lead to change. This paper investigates the possibility of such (ongoing) change in the Hungarian vowel backness harmony system. It does so by examining it in apparent time, contrasting how younger and older speakers supply suffixes to harmonically mixed stems. It asks whether younger speakers are more likely to supply front suffixes to mixed stems than older speakers, and whether the well documented effect of vowel height (Hayes & Londe Cziráky, 2006) is similar for the two groups. Data was collected through the employment of a wug-test (Berko, 1958). There was no evidence found for younger speakers being more likely to supply front suffixes compared to older speakers, or a difference between the age groups with regards to the effect of vowel height. Consequently, there was also no direct evidence found for a change in the harmony system. A post hoc observation of a possible difference between the age groups at mid vowel height was made, warranting further research.

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1. Introduction

Hungarian vowel harmony and its certain aspects are a part of the Hungarian language that have been heavily researched in both the Hungarian academic sphere (e.g., Kontra, Ringen & Stemberger, 1989; Forró, 2013; Fejes & Rebrus, 2019) and the international one (e.g., Hayes & Londe Czirák, 2006; Benus & Gafos, 2007; Vishogradska, 2017). Several attempts have been made to model this harmony in a theoretical framework (e.g., Ringen & Vago, 1998; Hayes et al., 2009; Rebrus & Törkenczy, 2021), or to summarize the research and what we know about it (e.g., Törkenczy, 2011; Rebrus, Szigetvári & Törkenczy, 2012). As Törkenczy (2011) points out, most of the research has been done specifically on backness harmony and neutral vowels (e.g., Ringen, 1988; Ringen & Kontra, 1989; Rebrus & Törkenczy, 2016), as they pose the most problems. Within this frame, some have attempted to describe certain phonetic characteristics of neutral vowels in order to explain their behaviour (e.g., Benus & Gafos, 2007), some examined possible dialectal variation and differences (e.g., Blaho & Szeredi, 2013), and others focused on harmony in loanwords (e.g., Kontra & Ringen, 1986; Vishogradska, 2017). However, despite the extensive research surrounding it, to my knowledge, linguists have been unable to reach a consensus as to how to best describe neutral vowels in Hungarian, how to categorize them, if they can be classified, and the phenomenon as a whole.

Part of the problem is that there is extensive inter-speaker variation (Blaho & Szeredi, 2013), as well as the adaptation of loanwords that introduced non-native phonological patterns (Forró, 2013). Furthermore, Forró (2013) points out that the possibility of changes taking place in the present has been largely neglected by scholars, and that studies that do consider change happening (e.g., Szépe, 1958) make inaccurate claims, as well as describe processes that have been in motion for a long time. She herself attempts to find diachronic explanations for the patterns exhibited today, and one of her relevant findings is that the proportion of stems that get front suffixes has increased, due to adapting more and more foreign words with mixed root vowels, where speakers of Hungarian could not rely on clear rules as to which suffixes they should get. While she believes that the actual system that is applied to stems did not change, and speakers simply used analogy to handle the new stems, she notes that it cannot be ruled out that a change might occur in the future as a consequence of the increase in front stems, nor is it clear whether there is such change happening at the time of her paper. Therefore, since

more than 10 years have passed since then, it could be fruitful to assess whether there is a change happening in the harmony system of Hungarian. Additionally, Forró remarks that throughout the long timeframe that Hungarian vowel harmony has been the topic of research, no one has investigated the effect of speaker age on the system of vowel harmony in suffixation. She highlights that such research would be important in examining the possibility of change happening within the system.

Thus, this current paper aims to address the possibility of change in the Hungarian vowel backness harmony system, by examining it in apparent time, through different generations of speakers. The general question is whether there has been a change in how speakers of Hungarian apply vowel harmony, with regards to neutral vowels, and the specific research questions used to answer this are:

- RQ1. Are speakers from younger generations more likely to supply front suffixes to mixed stems than speakers from older generations?
- RQ2. Do younger speakers exhibit a more pronounced Height Effect (explained in Section 2.2.) than older speakers?

Participants are administered a wug-test, where they are given nonwords that abide by native Hungarian phonotactics and therefore could be perceived as native Hungarian words that participants are just not familiar with. The hypothesis is that if the increase in front stems has led to a change in the overall harmony system, then either:

- H1. Younger speakers will be more likely to supply front suffixes to mixed stems compared to older speakers.

or:

- H2. The Height Effect will be more pronounced for speakers in the younger age group compared to speakers in the older age group.

Conversely, should the number of front suffixes the speakers from the younger generations supply not differ significantly from the number the speakers from the older generations supply, and the interaction effect between age group and height not be significant, that would imply that there is no evidence that the increase in the number of front stems led to change in the overall harmony system. It is also possible that contrary to H2, the Height Effect will be *less* pronounced for younger speakers, implying that this statistical tendency is disappearing. While unlikely, such an outcome would also serve as evidence for change.

In Section 2, the relevant background information about Hungarian is provided, including the vowel inventory of Hungarian as well as the general rules of vowel harmony in the language. In Section 3, the methods of the study are laid out in detail, including how the

nonword stimuli and the sentences were created. Section 4 discusses the results of the wug-test, Section 5 provides the discussion of the results in relation to the research questions, addresses the limitations of the current study, and provides possibilities for future research, and Section 6 concludes the paper.

2. Background Information

2.1. The Hungarian Vowel Inventory

Hungarian has 14 phonologically contrastive vowels, which are arranged into seven phonological short-long pairs (Rebrus et al., 2012). These vowels are presented in Table 1, with the short vowels on the left side of their cell and the long vowels on the right side. The italic forms represent the Hungarian orthography of the vowels, while the forms between brackets are the surface representations of the vowels in the International Phonetic Alphabet (IPA).

Table 1

The Vowel Inventory of Hungarian

	front				back	
	unrounded		rounded			
high	<i>i</i> [i]	<i>í</i> [i:]	<i>ü</i> [y]	<i>ű</i> [y:]	<i>u</i> [u]	<i>ú</i> [u:]
mid		<i>é</i> [e:]	<i>ö</i> [ø]	<i>ő</i> [ø:]	<i>o</i> [o]	<i>ó</i> [o:]
low	<i>e</i> [ɛ]				<i>a</i> [ɔ]	<i>á</i> [a:]

For most of the short-long pairs, it is easy to see how they belong together – such as *i* [i] and *í* [i:] –, however, two of the pairs – *e* [ɛ] ~ *é* [e:] and *a* [ɔ] ~ *á* [a:] – have members that differ not only in length but also in quality. Despite this, in length alternations they still pattern together like the other short-long pairs (Rebrus et al., 2012). Furthermore, the exact IPA transcription of the vowel *a* is debated. It is often transcribed as [ɔ], [ɒ], or [ɑ], although phonetically, it is “more open than [ɔ] and less open than [a:], [ɑ], [...] has considerably less lip rounding than [ɔ, ɒ], but more than [ɑ]” (Törkenczy, 2011, p. 2965). However, the exact transcription of that vowel is not relevant for the investigation of vowel harmony, thus the (arbitrary) decision has been made to transcribe it as [ɔ]. Additionally, while phonetically it may be more accurate to describe [ɛ] as mid-low, in Hungarian phonology it is sufficient to

classify it as low (Siptár & Törkenczy, 2000). Important for this study is that all vowels are specified as either front or back, and thus there are no central vowels (Blaho & Szeredi, 2013).

2.2. Vowel Harmony in Hungarian

Vowel Harmony is a phenomenon where within a domain – such as the word – all the vowels need to agree – harmonize – with each other with regards to a certain phonological feature or property (Walker, 2012, p. 575). Törkenczy (2011) shows that in Hungarian, there are two types of vowel harmony: backness, or palatal, and roundness, or labial. In both cases, the stem controls harmony, which means that the harmonic properties of the suffixes that get attached to a stem depend on the harmonic properties of the stem itself. As a result, most suffixes have several allomorphs that allows them to follow the harmony of the stem. The dative for example has two, the front variant *-nek* and the back variant *-nak*. Therefore, a stem containing a front vowel, such as *fű* [fy:] ‘grass’, takes *-nek*, as shown in (1), and a stem containing a back vowel, such as *vas* [vɔʃ] ‘steel’, takes *-nak*, as shown in (2). Törkenczy (2011) demonstrates that prefixes are outside of the harmonic domain, which can be defined as root+suffixes, and thus they do not have to be considered here.

(1) <i>fű-nek</i>	(2) <i>vas-nak</i>
[fy:-nɛk]	[vɔʃ-nɔk]
grass-DAT	steel-DAT
‘to the grass’	‘to the steel’

Roundness harmony only applies to some suffixes, and in general it posits that for these suffixes, on top of backness harmony, the front variant has to agree with the roundness of the stem as well (Törkenczy, 2011). As roundness harmony is not directly relevant to the current study, it is largely disregarded. Instead, the focus shall be on backness harmony.

In backness harmony, vowels within the harmonic domain are required to agree in backness, where phonetic back vowels are considered harmonically back (B), front rounded vowels as front (F), and front unrounded vowels as neutral (N) (Törkenczy, 2011). There have been debates about the status of the front unrounded vowel *e* [ɛ], as “in some respects *e* is like a neutral vowel and in others it is like a harmonic [front] vowel” (Kontra & Ringen, 1986, p. 2). However, it has traditionally been considered neutral, and accounts that treat neutrality not as categorical, but as gradual, argue that the problem is not with whether the vowel is neutral, but with the concept of neutrality as a categorical property of vowels (Rebrus & Törkenczy,

2016). Hence, the current analysis refers to *e* as a N vowel. If there are both F and B vowels in the stem, the final vowel determines the backness of the suffix vowel (Törkenczy, 2011). (3) is an example for when a F vowel is followed by a B one, and the stem accordingly gets a B suffix (*-nak*), and (4) shows an example where a B vowel is followed by a F one, and the stem accordingly gets a F suffix (*-nek*).

(3) <i>niiansz-nak</i>	(4) <i>zsonglőr-nak</i>
[nyɔ̃ns-nɔk]	[ʒɔŋlø:r-nɛk]
nuance-DAT	juggler-DAT
‘to the nuance’	‘to the juggler’

Neutral vowels are considered separately from harmonically front vowels because the former may behave transparently while the latter cannot (Törkenczy, 2011). For example, if a B vowel is followed by a F one, the F vowel will act opaquely and trigger front harmony, as can be seen in (4), repeated again below. There, the B vowel *o* is followed by the F *ő*, and *ő* triggers F harmony, which can be seen in the dative suffix containing *e*, instead of *a*. Note that even though *e* is considered harmonically neutral, it still acts as the front variant for a number of noun cases, including the dative. However, if a B vowel is followed by a N one, the N vowel may act transparently and the backness of the B vowel carries on, as shown in (5). There, the B vowel *a* is followed by the N *i*, but the dative suffix contains the vowel *a*.

(4) <i>zsonglőr-nak</i>	(5) <i>papír-nak</i>
[ʒɔŋlø:r-nɛk]	[pəpi:r-nɔk]
juggler-DAT	paper-DAT
‘to the juggler’	‘to the paper’

According to Rebrus et al. (2012), when a stem contains only N vowels, and is longer than three syllables, the suffix it gets is always front. This is exemplified by (6), where the all-neutral *szintézis* receives *-nek*. In a mono- or bisyllabic stem that contains N vowels only, the suffix is usually front. (7) is an example of a bisyllabic stem, and (8) is of a monosyllabic one, both receiving the front suffix *-nek*. However, for a closed, lexically specified set of words the suffix they receive is back. An example of the latter is shown in (9), where the root has the same N vowel as in (8), *i* [i:], and yet this time the stem receives the back variant of the dative, *-nak*. This behaviour is referred to as antiharmony and mainly concerns monosyllabic stems

containing *i* or *í* (Rebrus et al., 2012). In monosyllabic stems, antiharmony is extremely rare when the vowel is a mid *é*, and never occurs when the vowel is a low *e*.

(6) <i>szintézis-nek</i>	(7) <i>kifli-nek</i>	(8) <i>szív-nek</i>	(9) <i>híd-nak</i>
[sinte:ziʃ-nɛk]	[kifli-nɛk]	[si:v-nɛk]	[hi:d-nɔk]
synthesis-DAT	crescent_roll-DAT	heart-DAT	bridge-DAT
‘to the synthesis’	‘to the crescent roll’	‘to the heart’	‘to the bridge’

While in backness harmony N vowels may behave transparently, it is not always the case, and according to Törkenczy (2011), their behaviour after B vowels is not fully predictable. They may trigger front harmony (e.g., *koncert-nek/*nak* [kontsɛrt-nɛk/*nɔk] ‘concert-DAT’), may be transparent, as in (5), or may cause the suffix to vacillate, meaning that both the front and the back variant are possible (e.g., *fotel-nek/nak* [fotɛl-nɛk/nɔk] ‘armchair-DAT’). There are certain statistical tendencies, however, that can help better describe the behaviour of these vowels. First, there is the Height Effect, which posits that the higher a N vowel is, the more likely it is that they behave transparently (Hayes & Londe Cziráky, 2006). Thus, *i* and *í* are very likely to be transparent, while *e* is less likely. There is also the Count Effect, which postulates that the more N vowels there are at the end of the stem, the less likely it is that they will be transparent (Hayes & Londe Cziráky, 2006). Thus, a BN root is more likely to get a back suffix than a BNN one. Furthermore, Hayes et al. (2009) found some ‘unnatural’ constraints that influence Hungarian harmony, where if the last consonant of the stem is a bilabial noncontinuant, a sibilant, a coronal sonorant, or a consonant cluster of two, the stem is more likely to receive a front suffix.

With regards to roots by themselves, they can be put into three categories: disharmonic, where F and B vowels combine (e.g., *sofőr* [sofø:r] ‘driver’, *nüansz* [nyɔns] ‘nuance’), mixed, where B vowels combine with N ones (e.g., *haver* [høvɛr] ‘friend’, *kódex* [ko:dɛks] ‘codex’, *szekta* [sɛktɔ] ‘sect’), and simple, where they are not mixed or disharmonic (Törkenczy, 2011). Mixed roots are much more common than disharmonic ones, with many from the latter category being loanwords. Roots may also be categorized according to the harmonic behaviour of suffixes they cooccur with. They may trigger alternating suffixes to appear in their back allomorph, their front allomorph, or with both allomorphs possible. It is important to note that not all suffixes in Hungarian are alternating, which means that not all of them partake in harmony. Among those that do, there are three types: quaternary suffixes, where the vowels [o], [ɔ], [ɛ], and [ø] alternate (e.g., the plural), ternary suffixes, where the vowels [o], [ɛ], and

[ø] alternate (e.g., the allative noun case), and binary suffixes, where two vowels alternate, with one being front and the other back. Examples of binary suffixes are provided in (10). (10)i. shows an example of a back (a) and a front (b) stem taking the corresponding inessive suffix, while ii. shows an example of a back (a) and a neutral (b) stem taking the corresponding ablative suffix. Because quaternary and ternary suffixes also involve roundness harmony, only binary suffixes are considered in this study.

(10)i. a) <i>tok-ban</i>	b) <i>tök-ben</i>	ii. a) <i>hal-tól</i>	b) <i>méh-től</i>
[tok-bøn]	[tøk-bɛn]	[həl-to:l]	[me:h-tø:l]
sheath-INESS	pumpkin-INESS	fish-ABL	bee-ABL
‘in the sheath’	‘in the pumpkin’	‘from the fish’	‘from the bee’

3. Methods

3.1. Participants

31 legally competent speakers of Hungarian over the age of 18 took part in the study. They were recruited through convenience and snowball sampling, as well as through online platforms such as Facebook. Participants were sorted into two groups based on their age: a ‘younger’ group, comprising of participants from the age of 18 up to and including participants with 37 years of age, and an ‘older’ group, comprising of participants above the age of 37. The younger group consisted of 15, and the older group of 16 participants. The decision to make the age of 37 the point of divide between the two groups is based on the average life expectancy of Hungarians at birth, which was approximately 74 years in 2021, divided by two (World Health Organization, 2024).

All participants reported normal or corrected to normal vision, as well as having no language disorders.

3.2. Procedure

The research and the experimental procedure were approved by the Ethics Committee of the Faculty of Humanities of the University of Amsterdam. Participants were asked to fill out a questionnaire online, through the survey platform Qualtrics (<https://www.qualtrics.com>). The entire questionnaire was in Hungarian. They were first presented an information brochure about the study and an informed consent form, where they could give their consent by selecting the corresponding option. If a participant selected the option that corresponded to them not consenting, the questionnaire automatically ended, and no data was stored. After consenting,

participants were asked to indicate their age and the languages they spoke. None of the participants reported speaking a language that has vowel harmony, other than Hungarian. If a participant indicated an age that was below 18, the questionnaire automatically ended, and no data was stored. Afterwards, they were given a wug-test consisting of 30 tasks. All tasks were presented in a randomized order.

The wug-test was originally devised by Berko (1958), in order to test whether English-speaking children had internalised the representations of morphological rules by asking them to apply these on nonwords, such as *wug*. Since then, the wug-test has largely become a term referring to any experiment aiming at testing speakers' competence by the usage of nonwords (Forró, 2013). Using a wug-test in order to gain information about how speakers apply Hungarian vowel harmony has been done before by Hayes and Cziráky Londe (2006), and Hayes et al. (2009). A similar kind of sentence completion task has also been used with existing words. Notably, Kontra and Ringen (1986) used it with loanwords, and Ringen and Kontra (1989) with other, already existing neutral words.

Before the test began, participants were shown instructions accompanied by an example. During the tasks, participants had the opportunity to view instructions again via a button at all times. They were first presented a sentence that included the target nonword in a syntactic position where it was not suffixed, ensuring that participants are not primed or in any way told how the vowels in the nonword behave harmonically. They were then given a sentence with a blank, where they had to insert the target nonword in the form they believed was correct. The target word was bolded in the initial sentence, so as to ensure that participants know which word they have to insert into the second one. The instructions participants received specified that they had to insert the bolded word and only the bolded word into the blank. The structure of the second sentence forced participants to supply the target word in a case that had binary suffixes corresponding to vowel backness. This way, the vowel of the suffix participants supplied can indicate whether participants treated the N vowel of the target transparently or opaquely. An example of a task is shown in (11), followed by an English translation.

(11) A kocsma melletti épületben egy **manyig** van. Pista bemegey a ____.

‘In the building next to the pub is a **manyig**. Pista goes into the ____.’

Participants in this case would have to insert the word *manyig* in the illative noun case, choosing between the front variant *manyigbe* and the back variant *manyigba*.

3.3. Stimuli

30 nonwords were included in the test, with nine of them consisting of a B vowel and a high N vowel, again nine of them consisting of a B vowel and a mid N vowel, another nine consisting of a B vowel and a low N vowel, and three bisyllabic control words, containing no N vowels. These control words were included as a way to see if any participants diverged from the regular harmonic pattern in cases that did not involve N vowels and therefore should not be ambiguous. These participants could be expected to handle vowel harmony differently in general, and not just with regards to N vowels. No participant supplied such answers to any of these control stimuli. All of the target nonwords were made bisyllabic in order to control for the Count Effect. The full list of nonwords can be found in Appendix A. All of the made-up words were constructed in accordance with the phonotactics of native Hungarian words, as described in Kenesei et al. (1998). Therefore, word-initial consonant clusters, final *ö*, *o*, and *á*, as well as adjacent vowels were avoided. To control for the count effect, all items were disyllabic. This was also meant to control for any other effects of syllable number (Törkenczy, 2011; Ringen & Kontra, 1989; Rebrus et al., 2012). In order to avoid the possible effects of the unnatural constraints described by Hayes et al. (2009), the test items could not end in a bilabial noncontinuant, a sibilant, a coronal sonorant, or a cluster of two consonants. Due to an oversight, a number of participants were shown *panyíc* instead of *panyív* for nonword stimulus no. 8, which violated this. As a consequence, these stimuli were excluded from the analysis.

Because Kontra and Ringen (1986) claim that in compounds, the second element determines the suffix, where they behave as if they were by themselves, the paper follows Hayes and Cziráky Londe (2006) in making an effort to avoid nonwords that could be interpreted as a compound. Furthermore, care was taken to avoid words ending in *a* or *e*, in order to avoid upgrading height by lengthening, as described in Rebrus et al. (2012). While several accounts describe a possible effect of word-stress (e.g., Ringen & Kontra, 1989; Kontra & Ringen, 1986), because in Hungarian the primary stress is always on the first syllable (Kenesei et al., 1998), this should not show here, as all test items of interest start with a syllable containing a B vowel.

30 frames in which the nonwords could be inserted were created. All of these, accompanied by English translations can be found in Appendix B. They involve nine noun cases that are marked by binary suffixes, with three or four sentences in each case. No single nonword stem was affiliated with a specific frame, and instead the stem inserted into each frame was chosen randomly for each participant. Care was taken to construct frames in a way that would be natural, and also that the nonwords inserted into them would feel more like

regular native Hungarian words, that participants just happen to not know. This was necessary, because according to Vishogradska (2017), speakers treat loanwords differently from native words, marking them as foreign in this way.

Kontra and Ringen (1986) conducted a test similar to a wug-test, but with existing loanwords, and they point out that when constructing these frames, extra attention must be paid to the determiners preceding the target word. They found that when a preceding determiner was in the same case as the target word, the suffix of the determiner had a priming effect on the allomorph of the suffix of the target word. Therefore, care was taken that this does not happen in any of the 30 frames used in this study.

4. Results

The dependent variable is the variant of the suffix attached to the nonwords, which is either front or back, meaning that this variable is binary. There are two independent variables: the between participants variable age group, which is either younger or older, and the within participants variable height of the neutral vowel in the nonword, which is either high, mid, or low. The latter was analysed as an ordered factor. Main effects of age group and vowel height, as well as their interaction effect were analysed using a logistic regression model in R (Version 4.4.2). A significance level of 0.05 was chosen to determine whether results are statistically significant.

4.1. Data Preparation

Even though care was taken to make the wug-frames clear and have them require a specific noun case, participants sometimes gave answers that were different than expected, while often remaining grammatical. Most of these involved the usage of a different noun case than the one the frame was supposed to elicit, but where the suffix was still binary and thus reflective of the participant's choice with regards to vowel harmony. These answers were treated as if the noun case did not differ, and thus were included in the analysis, even if the case supplied by the participant was not grammatically appropriate. However, in instances where the form supplied included a case that had non-binary suffixes, such as ternary suffixes, responses were excluded from the analysis.

Individual responses were also excluded when participants changed the nonword stimuli's original B vowel to a F or N one, did not supply a suffix and just repeated the nonword, or ignored instructions and gave several words, or one completely different from the target nonword. In a few cases participants provided a form where they attached several

different suffixes to the target nonword, such as inserting a diminutive before the noun case in wug-frames where the target nonword was understood to be an animal. In all of these cases the suffixes involved were binary and the ones attached to the same stem agreed in backness, and thus they could be included in the analysis.

Additionally, while the frames and the nonword stimuli were created as to not allow lengthening of the N vowel, and thus not allow upgrading the phonologically low *e* to a phonologically mid *é*, in a handful of answers participants still applied the lengthening process. In these instances, the height of the N vowel was coded as the height of the lengthened vowel.

This resulted in 769 valid, analysable responses and 36 invalid ones, excluded from the analysis.

4.2. Effects of Age and Height

The raw numbers for all response categories can be found in Table 2. ‘Front’ and ‘Back’ refer to the type of suffix participants supplied, and ‘Young’ and ‘Old’ refer to the age group the participants belong to. ‘Vowel type’ refers to the height of the N vowel in the target nonword.

Table 2

The Number of Responses per Category

Vowel type	Front		Back		Total
	Young	Old	Young	Old	
High	5	3	110	121	239
Mid	50	32	80	107	269
Low	109	113	21	18	261
Total	164	148	211	246	769

Figure 1 shows the percentage of front and back responses by the age groups. The raw count of responses can be seen in the center of the relevant part. The percentage of front suffixes is higher for the younger age group (43.73%) than the older group (37.56%), and for both groups the percentage of back suffixes (62.44% for the older group and 56.27% for the younger group) is higher than the percentage of front suffixes. The main effect of age group on suffix choice showed no statistical significance ($p = 0.182$, $z = 1.336$, $OR = 1.469$, 95% CI: [0.843, 2.676]).

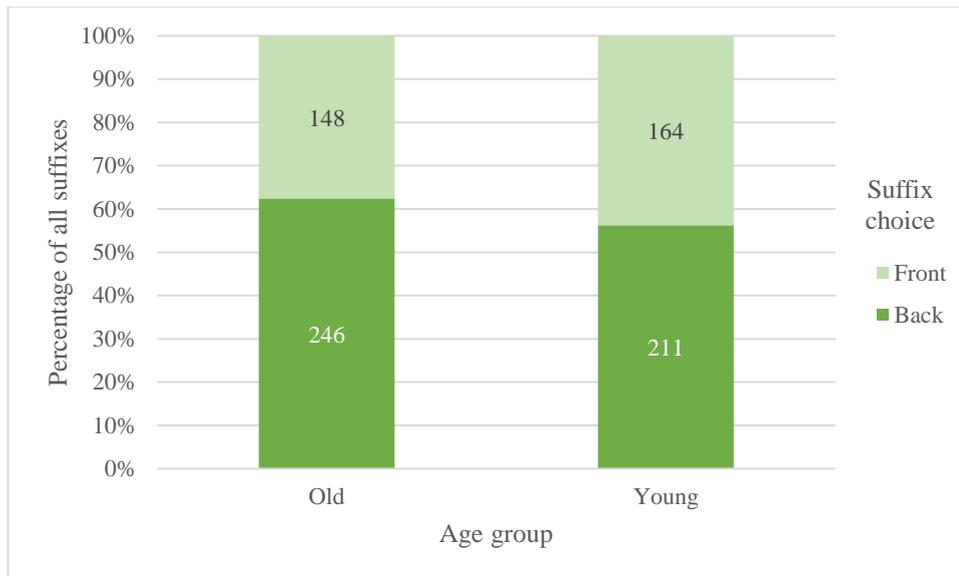


Figure 1

Percentage of Front and Back Suffixes by Age Group

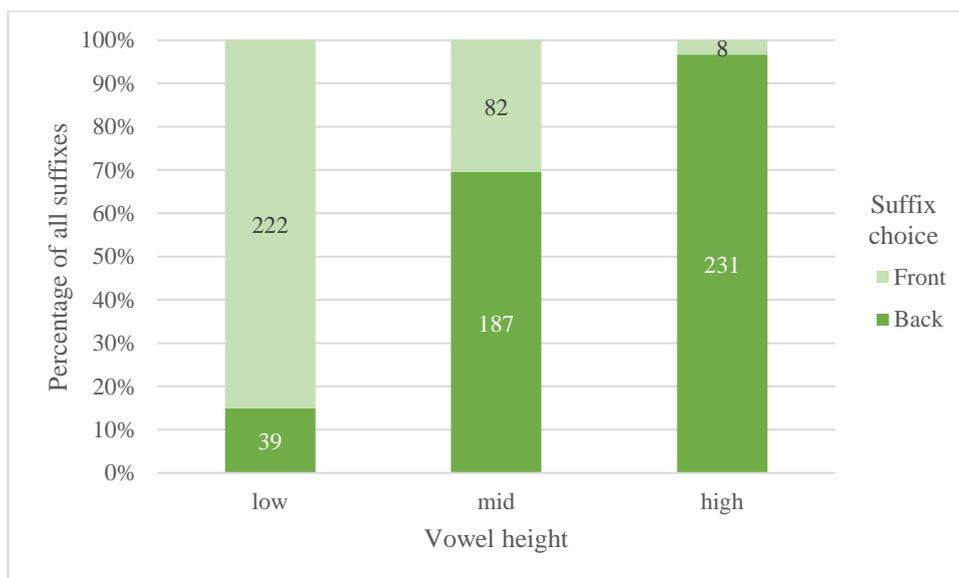


Figure 2

Percentage of Front and Back Suffixes by the N Vowel's Height

The percentage of front and back suffixes by height is shown in Figure 2, with the raw count of responses in the center of the relevant part. The majority of responses for low vowels were front suffixes (85.06%), while the majority of responses for mid and high vowels were back suffixes (69.52% for mid and 96.65% for high vowels). As the height of the neutral vowel increases, the percentage of responses supplying a front vowel decreases (85.06% for low, 30.48% for mid, and only 3.35% for high). This linear trend as the main effect of height on

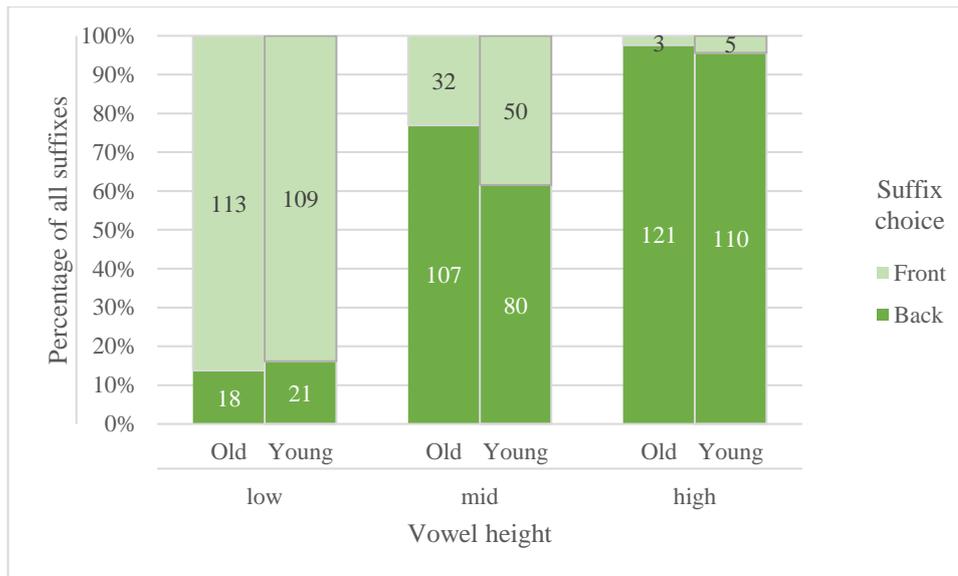


Figure 3

Percentage of Front and Back Suffixes by Age Group and the N Vowel's Height

suffix choice is statistically significant ($p < 0.001$, $z = -12.532$, estimate = -3.632 , 95% CI: $[-4.263, -3.109]$).

Figure 3 presents the percentage of front and back suffixes chosen by the age groups at each vowel height, again with the raw count of responses in the center of the relevant part. The percentage of front responses decreases as the vowel height increases in both age groups. For the older group, the percentage goes from 86.26% at low, through 23.02% at mid to only 2.42% at high N vowel height. The percentage of front suffixes for the younger group falls from 83.85% at low, through 38.46% at mid to 4.35% at high vowel height. The interaction effect between age group and vowel height is not statistically significant ($p = 0.331$, $z = 0.972$, OR = 1.756, 95% CI: $[0.574, 5.96]$).

However, when looking at the responses to items with a mid N vowel, there seems to be a somewhat greater difference between the age groups than with items with a low or high N vowel. Therefore, a post hoc analysis of items filtered down to mid height was done. The odds of choosing a front suffix for BN_{mid} stems were 2.089 times higher for participants in the younger age group than for participants in the older age group. It is important to note that even though this may look significant, and a logistic regression returns a p-value below 0.01 ($z = 2.726$), there was no correction done for the multiple comparison problem. Furthermore, this test was done after it was already known what the sample looked like, and that the number of F responses for mid items was higher for younger participants than older ones. Thus, the assumptions for statistical testing were not met and the chance of a false positive is elevated.

Therefore, the difference between the odds of the two age groups here cannot be treated as statistically significant or true for the population.

5. Discussion

5.1. Interpretation of Results

This study aimed to examine the possibility of change in the Hungarian vowel backness harmony system, by examining it in apparent time, contrasting speakers from an older and a younger age group. The general question was whether there has been a change in how Hungarian speakers apply vowel harmony, with regards to neutral vowels. The two research questions posed were whether younger speakers are more likely to supply front suffixes to mixed stems compared to older speakers (RQ1), and whether younger speakers will produce a more pronounced Height Effect than older speakers (RQ2). It was hypothesized that if age had an effect on suffix choice, and younger speakers are more likely to supply front suffixes than older speakers (H1), or if there was a significant interaction effect between age group and vowel height, and younger speakers exhibit a more pronounced Height Effect (H2), then that would imply that the increase in front stems has led to an (ongoing) change in the Hungarian harmony system.

The results showed that there was no evidence of a main effect of age on suffix choice, and that overall, any differences between younger and older speakers in their likelihood of supplying a front suffix to a mixed BN stem fail to reach significance. Therefore, the null hypothesis of no effect cannot be rejected for RQ1. Analysis involving the height of the N vowel in the stems shows that the data is very clearly in line with the Height Effect described by previous research, which means that it is possible to contrast height for the age groups. The linear trend of the odds of choosing a front suffix decreasing as the vowel's height increases is comparable for both age groups. There is no evidence that the slope for the younger age group would significantly differ from the slope for the older age group. Therefore, the null hypothesis of no effect cannot be rejected for RQ2, either.

The lack of evidence supporting a main effect of age on suffix choice or a significant interaction effect between age group and vowel height undermines the original hypothesis of a possible (ongoing) change. However, the post hoc observation of a possible difference between age groups at BN_{mid} items warrants further investigation. Should future research find that younger speakers are indeed more likely to supply front suffixes to mid items compared to older speakers, that would serve as evidence for (ongoing) change in the harmony system. In fact, it would make sense for mid items to be the most susceptible to change and variation, as

– by definition – they are in the middle of the Height Effect. Low and high N vowels are both at one end of the Height Effect, and thus the statistical tendencies of the Effect could be stronger for these vowels. It is possible that because of being at one end or the other, these vowels are more easily categorized by speakers as more opaque (low vowels), or more transparent (high vowels), perhaps even to extremes (recall how only 3.35% of responses supplied a F suffix for high items). At the same time, mid vowels have more difficulties leaning in either direction by virtue of being in the phonological, statistical tendency middle. This allows them to be more flexible in how speakers treat them, letting them be handled as opaque or transparent rather freely.

5.2. *Limitations*

Due to time and monetary constraints, the participants were primarily recruited through convenience and snowball sampling. While this was seen as the only means to gather participants in the available time and through the available means, it does mean that the sample is not random and may be biased. Participants' dialects, sociolects, gender, or education were also not controlled for, which could be confounding factors.

While the dividing point between the younger and the older age group was determined based on the average life expectancy of Hungarians at birth, it is still a somewhat arbitrary decision, as people do not neatly fit into either being young or old, nor do they turn from young to old from one day to another. Consequently, dividing participants into two age groups compromises how well they reflect reality. For future studies, treating age as a continuous variable instead of a binary one could result in more nuanced and informative data.

Furthermore, the usage of a wug-test for the study could potentially skew results. As Hayes and Cziráky Londe (2006) point out, the rarer an item is in the Hungarian lexicon, the more likely it is to take front suffixes. And wug-test nonwords are by definition, the rarest stems there are. Additionally, asking speakers to supply one version of a binary suffix may oversimplify the actual variation. Hayes and Cziráky Londe (2009) attempted to mitigate this problem by, alongside the forced decision task, also asking participants to rate both variants of suffixed stems on a 7-point scale. Future studies could adopt a similar approach to gather more nuanced and informative data.

While the nonword stimuli were created in a way that tried to make the items feel like native Hungarian words, as well as monomorphemic ones, it is not possible to determine whether that has actually been successful.

Additionally, while care was taken to make the wug-frames clear and require a specific noun case to be supplied, participants sometimes gave answers that were different than expected, while often remaining grammatical, revealing an issue with certain frames. For example, frame no. 8. was originally meant to elicit responses with the inessive noun case, conveying that Zsolt (the subject person in the frame) is *in* the place denoted by the target nonword, however, a few participants supplied a response with the adessive noun case, conveying that Zsolt is *at* the place. While this response was not foreseen, it is perfectly grammatical and has an almost identical meaning. While it should not matter what noun cases were used in the experiment, as there has been no evidence in previous research that would suggest that there is an effect of noun case on harmony, it could still serve as a confounding factor. Thus, the frames used by this study need to be further clarified and improved before further use. Involving several native speakers to check the frames might be beneficial, in that it may result in more diverse perspectives and ideas.

5.3. Future Research

The current study leaves much room for future research to be conducted with regards to neutral vowels in Hungarian vowel harmony and the possibility of change. Alongside addressing the aforementioned limitations of this study, future research could include mixed stems that are not disyllabic, with varying numbers of N vowels, examining the interaction between the Count Effect and age. Furthermore, the difference between the age groups at mid height observed in this study calls for further investigation, focusing on mid height neutral vowels. The investigation of other (social) factors that could have an effect on vowel harmony, such as gender, dialect, or education, could also be worthwhile.

6. Conclusion

This study aimed to investigate the possibility of change in the Hungarian vowel backness harmony system. According to Forró (2013), the proportion of stems that require a front suffix has increased in the language, which could lead to change. As more than ten years have passed since, and there has not been research investigating potential change, the current study's goal was to take a step towards filling that gap by examining the harmony system in apparent time, by contrasting younger and older speakers. Participants were administered a wug-test (Berko, 1958) comprising of 30 bisyllabic nonwords inserted into 30 frames, where participants had to supply suffixed forms of the test items, and therefore had to apply backness vowel harmony. It was hypothesized that if the increase in stems requiring front suffixes has

led to change, then either younger speakers will be more likely to supply front suffixes to mixed stems compared to older speakers, or the Height Effect will be more pronounced for younger speakers compared to older speakers.

In conclusion, this study found no direct evidence for (ongoing) change in the vowel backness harmony system of Hungarian. There was no evidence for an effect of age on suffix choice, or an interaction between age and the N vowel's height. A post hoc observation was made about BN stems with a mid N vowel, where there is the possibility of a difference between age groups. Further research on the topic is needed to fully explore the possibility of (ongoing) change in the Hungarian vowel harmony system.

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Appendices

Appendix A

Nonword Stimuli

- | | |
|---|-----------------------|
| 1. manyig [mɔ̃ɲig] | 16. vásték [va:ʃte:k] |
| 2. vánit [va:nit] | 17. cotlék [tsotle:k] |
| 3. pontli [pontli] | 18. bortég [borte:g] |
| 4. kumpit [kumpit] | 19. kontef [kontɛf] |
| 5. panit [pɔ̃nit] | 20. kandev [kɔ̃ndɛv] |
| 6. kopsi [kopʃi] | 21. sunteg [ʃunteg] |
| 7. topri [topri] | 22. ványek [va:ɲɛk] |
| 8. panyíc [pɔ̃ɲi:ts] /panyív [pɔ̃ɲi:v] ¹ | 23. lótek [lo:tɛk] |
| 9. tumbíg [tumbi:g] | 24. nyátek [ɲa:tɛk] |
| 10. szolét [sole:t] | 25. csazeg [tʃɔ̃zɛg] |
| 11. lunnéd [lunne:d] | 26. fufej [fufɛj] |
| 12. hakéj [hɔ̃ke:j] | 27. sumptek [ʃumptɛk] |
| 13. gyakéd [ɟɔ̃ke:d] | 28. mögyü [møɟy] |
| 14. zsutég [ʒute:g] | 29. mandok [mɔ̃ndok] |
| 15. mandév [mɔ̃nde:v] | 30. kömpag [kømpɔ̃g] |

Appendix B

Frames, by Noun Case², with English Translations

ILLATIVE

- Petinek nincs szekrénye, csak egy ___ áll a szobájában. Így ő a dolgait a ___ rakja.
'Peti doesn't have a wardrobe, only a ___ stands in his room. So, he puts his things into the ___.'
- Az asztalon egy ___ van. Annának nem elég édes, ezért rak egy kis cukrot a ____.
'There is a ___ on the table. Anna thinks it's not sweet enough, so she puts some sugar into the ___.'
- A kocsmá melletti épületben egy ____ van. Pista bemegy a ____.
'In the building next to the pub is a ____ . Pista goes into the ___.'

¹ Due to an oversight, some participants were shown *panyíc* instead of *panyív*. This stimulus was excluded from analysis.

² For some of the frames participants supplied other, grammatically acceptable noun cases. The frames are shown under the noun case they were originally meant to elicit.

ELATIVE

4. Édesanyám receptje alapján a kiflibe nem búzaliszt, hanem ____ kerül. Így én is mindig ____ csinálom a kiflit.
‘According to my mother’s recipe, crescent rolls are made out of ____, not flour. Thus, I also make crescent rolls out of ____.’
5. Daniéknál nincs ____, csak tölgy. Dani ezért nem tud ____ széket csinálni.
‘There is no ____, only oak, at Dani’s. That is why Dani cannot make a chair out of ____.’
6. Sanyi kertjében csak egy kuka és egy ____ van. Tegnap a szemetet véletlenül nem jó helyre dobta, úgyhogy azt ki kellett szednie a ____.
‘In the garden of Sanyi, there is only a trash bin and a _____. Yesterday, he accidentally threw his trash into the wrong one, so he had to take his trash out from the ____.’

INESSIVE

7. Szabolcs hálósobájának a sarkában egy ____ áll. A ____ tárolja a ruháit.
‘In the corner of Szabolcs’s bedroom stands a _____. He stores his clothes in the ____.’
8. Zsolt elvileg csak a boltba ment el, de a bolt mellett van egy ____ is. Mivel Zsolt még mindig nem ért haza, ezért valószínűleg a ____ van.
‘Zsolt supposedly only went to the supermarket, but next to the supermarket is a _____. Since Zsolt is still not home, he is probably in the ____.’
9. Gizi a ____ mellé rakta a tollát, és most nem találja. Végül kiderült, hogy a toll a ____ volt.
‘Gizi put her pen next to the ____, and now she can’t find it. It turned out that the pen was in the ____.’

DELATIVE

10. Az iskola udvarán áll egy _____. Mari készített egy képet a _____.
‘On the schoolyard stands a _____. Mari took a picture of the ____.’
11. A városháza aulájában a ____ elromlott. A faluban mindenki a ____ beszél.
‘In the hall of the city hall the ____ broke. Everyone in the village is talking about the ____.’
12. Dávid étkezőjében van egy ____, rajta terítő. A barátnőjének az nem tetszik, ezért leveszi a terítőt a ____.

‘In Dávid’s dining room, there is a ____, and on it is a tablecloth. His girlfriend doesn’t like it, so she takes the tablecloth off from the ____.’

ABLATIVE

13. A ____ és az asztal között van egy szőnyeg. A szőnyeg a ____ az asztalig fut.
‘Between the ____ and the table is a rug. The rug runs from the ____ to the table.’
14. A szomszédom egy ____, tegnap adott is nekem virágot. Ki is raktam az ablakba a virágokat melyeket a ____ kaptam.
‘My neighbour is a ____, he gave me some flowers yesterday. I put the flowers I got from the ____ in my window.’
15. A húgom párja egy ____, most voltam a rendelőjében. Most már hazafele megyek a ____.
‘The partner of my younger sister is a ____, and I was just in their practice. I am now going home from the ____.’
16. Tengerre néző szobát foglaltunk, de egy ____ áll az ablakunk előtt. Így nem látjuk a tengert a ____.
‘We booked a room with sea view, but a ____ stands in front of our window. Thus, we cannot see the sea from the ____.’

SUBLATIVE

17. Józsi falán csak egy ____ van. Csak egy ____ tudja rakni a szerszámait.
‘On the wall of Józsi, there is only one _____. He can put his tools only on one _____.’
18. Sok a graffiti Zita városában, de a háza melletti ____ eddig érintetlen maradt. Tegnap viszont valaki rágraffitizett a ____ is.
‘There’s a lot of graffiti in Zita’s city, but the ____ next to her house has been untouched. However, yesterday someone graffitied on the ____.’
19. Ebben az erdőben él egy védett állat, a _____. A múlt héten viszont egy vadász rálőtt egy _____.
‘In this forest lives a protected animal, the _____. Last week however, a hunter shot at a _____.’
20. A lányunk tengerre néző szobát szeretett volna, de csak azt tudtuk kifizetni, ahol az ablak előtt áll egy _____. Így a szobánk a ____ néz.
‘Our daughter wanted a room with sea view, but we could only afford the one where a ____ stands in front of the window. Thus, our room faces the ____.’

DATIVE

21. Sok ___ nő a kertemben. Nagyon szeretem, mert a ___ nagyon jó illata van.
‘A lot of ___ grows in my garden. I really like it, as ___ has a really nice smell.’
22. Minden este jön egy ___ a kertembe. Ezért mindig rakok ki a ___ vizet.
‘Every night a ___ comes to my garden. That is why I always put out water for the ___.’
23. Ez egy ___. Ezt az állatot ___ hívják.
‘This is a ___. This animal is called a ___.’
24. Attila egyik ismerőse egy ___. A ___ van két macskája.
‘One of Attila’s acquaintances is a ___. The ___ has two cats.’

ADESSIVE

25. Kata fodrászának a testvére egy ___, úgyhogy bemutatta őket egymásnak. Kata most a ___ van.
‘The sibling of Kata’s hairdresser is a ___, so she/he introduced them to each other. Kata is now at the ___.’
26. Margit tegnap meglátogatta a ___ ismerősét, és most nem találja a pénztárcáját. Úgy látszik, hogy a ___ hagyta.
‘Yesterday Margit visited her ___ acquaintance, and now she can’t find her purse. It seems that she left it at the ___.’
27. Ilona előtt két lehetőség állt: a rendőrség vagy a ___ előtt parkol le. Végül a ___ állt meg.
‘Ilona had two choices: she parks in front of the police or the ___. Eventually she stopped at the ___.’

INSTRUMENTAL

28. Simon egyik barátja egy ___, és be akar minket mutatni egymásnak. Nem hittem volna, hogy egy ___ is megismerkedhetek.
‘One of Simon’s friends is a ___, and he wants to introduce us to each other. I didn’t think I could become acquainted with a ___.’
29. Apám garázsában van egy ___. Mivel jó jegyekkel diplomáztam, ezért megengedte hogy a biciklim helyett a ___ menjek be a városba.

‘In my father’s garage is a _____. Because I graduated with good grades, he allowed me to go into town with the _____ instead of my bicycle.’

30. Kifogytam a tollbetétből, és már csak egy _____ van a tolltartómban. Úgy tűnik, kénytelen leszek a _____ írni.

‘I ran out of pen inlays, and there is only one _____ in my pencil case. It seems that I will have to write with the _____.’