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# On Finnic and Khanty vowel harmony: Domains, slopes and their role in typology

The main purpose of this paper is to examine Finnic and Khanty vowel harmony. These languages play a central role in an article by Paul Kiparsky and Karl Pajusalu (2003). Their influential study suggests a typological classification of vowel harmony, which is claimed to be supported by a particular analysis in the Optimality Theory framework. In this paper a closer look will be taken at the linguistic data and the literature, and it will be argued that in many cases example languages and dialects are hardly classifiable into the suggested category. Based on data from the sources referred to by Kiparsky and Pajusalu on Estonian (Mulgi and Northeastern dialects), Veps and Khanty, it will be shown that these (varieties of) languages exhibit different patterns of (dis)harmony from what could be presumed based on their classification. Moreover, the suggested analysis ignores cases of variation (especially vacillation), typical for the example languages. In the present study, it is emphasized that many patterns do not arise from the behavior of neutral vowels, but instead, they can be results of the length and the nature of the harmonic domain. The paper also introduces the notion of harmonicity slope, according to which the domain has no strict borders, and in which the tendency for the vowels to harmonize gradually diminishes.

## 1. Introduction

A paper by Kiparsky and Pajusalu (2003; henceforward K&P) is frequently referred to in studies on vowel harmony (henceforward VH – see Baković 2003; Benus & Gafos 2007; Blumenfeld & Toivonen 2016; Finley 2008, 2009, 2010; Hansson 2010; Hayes & Cziráky 2006; Kabak 2011; Kabak et al. 2008; Leduc et al. forthcoming; Nevins 2010; Polgárdi 2015; Rebrus & Törkenczy 2015a, 2015b, 2016; Tolskaya 2014; Törkenczy & Rebrus & Szigetvári 2012, 2013). This article will focus on some data of the languages which they classified and will question the correctness of the classification. Additionally, it will be argued that the analysis provided by K&P cannot explain all the relevant phenomena in the vowel harmony of the classified languages.

In Section 2, I will present some basic terms, the most important features of the typology by K&P, and some criticism of it.

In Section 3, I will discuss the language Type d. In the typology of K&P, that is when neutral vowels are always followed by back-harmonic ones. The two example languages for this type are the Estonian Mulgi dialect and the Enarve dialect of Veps.

In Section 4, I will observe K&P's Type e, i.e. when neutral vowels are always followed by front-harmonic ones. This type is exemplified by Eastern Khanty and Northeastern Estonian.

In Section 5, I will summarize the most problematic issues of the categorization suggested by K&P, and I will sketch an alternative explanation for the possible types.

In this paper, the IPA is used to indicate the sounds and phonemes of the various languages. This is useful, since different sources use different transcription systems, and it would be difficult to interpret them, especially for those who are unfamiliar with the languages discussed. By default, phonemic transcriptions will be given between slashes. However, when a piece of data taken from a source contains a symbol which does not correspond to any of the phonemes, a phonetic transcription will be given between square brackets. Sporadically, when the transcription in the source is problematic for some reason, the original forms will also be cited.

## 2. Background

This paper[1] deals with VH and its typology, focusing on Finnic dialects and Khanty. The languages are among the example languages in K&P, the analysis and results of which I intend to challenge here. In the first subsection, the basic concepts used in the paper will be presented. In the next subsection, the typology of K&P will be sketched, and in the third subsection, I will briefly review the criticism which K&P have received up to now and why their results should be revised.

### 2.1. Vowel harmony: basic terms and concepts

VH is a (morpho)phonological phenomenon according to which two classes of vowels, usually divided by a feature (such as back, rounded or ATR/RTR) cannot occur inside a given domain. Vowels belonging to such a class are called *harmonic*. The typical domain of VH is the word; though the domain can be shorter, it only rarely crosses word boundaries (including the boundaries of parts of a compound). The activeness of VH can be captured in affixation, typically, but cross-linguistically not exclusively, in suffix alternation. Vowels – usually, but not necessarily different only in the harmonic feature – alternating due to VH are referred to as *harmonic pairs*.

Usually, some vowels can be combined with both classes of harmonic vowels at least in certain circumstances. These are called *neutral vowels*. However, the exact definition of neutrality can vary from author to author. Some vowels can behave as both harmonic and neutral in certain circumstances (cf. e.g. Rebrus & Törkenczy 2016). As an example, Hungarian suffixes containing /eː/ can be both invariant (the vowel does not undergo vowel harmony) and alternating (after back stems, these contain /ɑː/ instead of /eː/) (Rebrus & Törkenczy 2016: 244–245). In the former case, /eː/ behaves like a neutral vowel, but in the latter case, it behaves like a harmonic vowel.

Vowels that are regarded as neutral because they can follow any vowel are called *transparent* when the vowel following them must belong to the same class as the

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vowel before them; and they are called *opaque* when the vowel following them must belong to a given class (usually determined by the phonetic properties of the neutral vowel). To formulate it in a different way, opaque vowels are neutral to the left but harmonic to the right; while transparent vowels are not just neutral to both sides and not just avoid undergoing VH: they are completely invisible for harmony, which operates as if they were not there.

A *trigger* is the vowel which evokes vowel harmony and a *target* is the vowel which undergoes harmony. All the languages discussed in this paper exhibit progressive harmony, which means that the target is always to the right of the trigger. The term *trigger* will be used in cases when the target can potentially undergo harmony. For example, in the Hungarian form /ʃvɛjt͡s-bɒn/ 'Switzerland-INE' /ɛ/ is a trigger, despite the fact that it does not trigger harmony in the given form, since initial /ɛ/ usually must be followed by a front-harmonic vowel (and /ʃvɛjt͡s-bɛn/ also exists). Usually, the trigger and the target are in adjacent syllables, they can be separated only by transparent neutrals.[2]

Principally, consonants are also invisible for VH. Nonetheless, in many languages with VH, consonants can also play a smaller or bigger role; although, it is a question of analysis whether these phenomena are seen as parts of VH or different things interacting with VH. On harmony and approaches to its analysis, see e.g. Archangeli & Pulleybank 2007; Gordon 2016: 134–151; Katamba 1989: 211–214; Krämer 2018: 47–48, 55–56; Rose & Walker 2011, etc.

Another central concept used here is *vacillation*. This phenomenon occurs when an individual speaker uses (or at least accepts) two (or more) different forms of the same structure, in this case, more than one phonemic (or phonetic) implementation for the same morphological form. For example, many native Hungarian speakers use (or at least accept) both /fotɛlbɒn/ and /fotɛlbɛn/ as the realization of 'armchair-INE'. However, it is not always easy to decide whether such alternative forms in the data are reflections of real vacillation or some hidden distribution. Working with dialectal texts, only different forms uttered by the same informant can be considered undoubtedly as signs of vacillation. Nonetheless, in all cases when alternative forms come from informants belonging to a (form of a) language considered to be uniform, and there is no reason to suppose that the alternation follows from (sub)dialectal, generational, social or other differences, it will be taken as vacillation.

2. Forms like Finnish /ɑnonyːmi-ɑ/ 'anonymous-part' can be interpreted in a way that here the otherwise harmonic vowel /y/ is transparent. However, another explanation, according to which the back allomorphs are default, is much more plausible. In foreign words showing vacillation, the type /ɑnonyːmi-ɑ/ ~ /ɑnonyːmi-æ/, back-harmonic vowels always precede front ones; there are no words with front-harmonic vowels followed by back ones showing alternation. Supposed counterexamples, such as /hypoteːsi-ɑ/ ~ /hypoteːsi-æ/ 'hypothesis-part' contain two neutral vowels after the back-harmonic one, and the suffixes of such foreign words can vacillate even if they do not contain harmonic front vowels at all: /ɑdverbi-ɑ/ ~ /ɑdverbi-æ/ 'adverb-part'.

## 2.2. The typology of VH according to Kiparsky and Pajusalu

K&P published their fundamental groundbreaking study on the regularities of (dis)harmony[3] and the behavior of neutral vowels. According to their assertion based on variants of Finnic, complemented with Khanty and Uyghur, the differences between the possible patterns of disharmony in different languages (or variants) can be described with three different types: [[BN]F], [[FN]B] and [[N]B]. Here, B stands for back and F for front harmonic vowels, N for neutral vowels,[4] and squared brackets for morpheme boundaries. K&P (226) actually use the formulas [[ai]ä], [[äi]a] and [[i]a], respectively. However, these can be misleading since the letters do not indicate the phonemes themselves but the vowel categories. Therefore, in this article the abbreviations introduced by Rebrus & Törkenczy (2016: 240) will be applied.[5]

[[BN]F] shows that to a stem containing a back vowel in the penultimate and a neutral vowel in the last syllable, harmonizing suffixes are attached with their allomorph containing a front vowel. [[FN]B] shows a phenomenon which can be evaluated as the opposite case: a stem containing a front vowel in the penultimate and a neutral vowel in the second syllable must be suffixed by a back allomorph of a harmonizing suffix. While [[BN]F] is intended to indicate that N is opaque, [[FN]B] indicates that frontness does not "pass across" a neutral vowel (despite the fact that the neutral vowel is also front in the phonetic sense). [[N]B] shows that stems containing just neutral vowel(s) are suffixed by the back allomorph of harmonizing suffixes. It is important to emphasize that the formulas do not symbolize bi- and trisyllabic word forms, but e.g. [[BN]F] is applicable to any stem (or derived form) with a neutral vowel in the last and a back vowel in the penultimate syllable (that is [BBN], [BBBN], [NBN], [NBBN], [BNBN], [NNBN], etc., cf. K&P (225).

Since all the three patterns can be allowed or prohibited, theoretically eight types of combinations exist. However, K&P state that only four of these eight possibilities occur. (Two additional types of patterns are also mentioned: the prohibition of [[F]B] shows that the given language exhibits VH; and the possibility of [[B]N] shows that the vowel N is actually neutral, so the language has neutral vowels.)[6]

Due to their analysis in Optimality Theory, the presented patterns are allowed or prohibited, depending on the ranking of the constraints. For example, the possibility of the [[N]B] pattern is determined by the ranking of two constraints. This

3. Although the title of K&P refers to the typology of disharmony, a harmony system can be also characterized and classified by the disharmonic patterns it allows. In this sense, the typology of harmony and disharmony cannot be strictly separated.

4. In the discussed cases, neutral vowels are always front. The pattern [N[B]] could not be considered disharmonic with a back neutral vowel. Back non-alternating vowels, although classified as neutral ones, are claimed to be always opaque by K&P (221) and are not covered by the abbreviation N (which corresponds to i in K&P's notation).

5. K&P (227, 239) state that their analysis is also applicable to ATR or rounding harmony. Nonetheless, this disquisition is limited to front/back harmony.

6. As a matter of course, this statement can also be valid only when the neutral vowel is phonetically front.

disharmonic pattern is motivated by the constraint prohibiting marked (i.e. low or rounded) front vowels (abbreviated as **ä, *ö, *ü*), which can be maintained in initial syllables by a faithfulness constraint, while suppressed in non-initial syllables. The same disharmonic pattern is penalized by a constraint which says that "adjacent segments must have the same value of the feature [F]" (K&P: 223) and called AGR(F), where [F] stands for a particular feature, so in this case AGR(Back). Consequently, [[N]B] is prohibited when AGR(Back) is ranked higher than **ä, *ö, *ü*.

Although the three parameters theoretically allow 8 ($2^3$) language types, K&P argue that only four of them may occur – as their Optimality Theory analysis predicts. They illustrate the existing types with the languages and dialects listed in Table 1. The values identical for all the types are ignored here.

| | | [[BN]F] | [[FN]B] | [[N]B] |
|---|---|---|---|---|
| a. | Finnish | * | * | * |
| b. | Uyghur, W Estonian | * | * | ✓ |
| c. | (unattested) | * | ✓ | * |
| d. | "Enarve Vepsian"[7], Mulgi | * | ✓ | ✓ |
| e. | Khanty, NE Estonian | ✓ | * | * |
| f. | (unattested) | ✓ | * | ✓ |
| g. | (unattested) | ✓ | ✓ | * |
| h. | (unattested) | ✓ | ✓ | ✓ |

*Table 1*. The types of disharmony based on three parameters according to K&P (226).

Based on the analysis of K&P, it must be concluded that these types must be understood in such a way that "allowed" in fact means "obligatory": a language has only [[N]B] or only [[N]F] structures, not both. Accepting this, the typology seems to be valid intuitively.

Neutral vowels can be *active* (assimilating, spreading their phonetic frontness, behaving like a trigger: [[N]F]) or *passive* (non-assimilating: [[N]B]) – the preconception is that should-be-harmonizing vowels are back by default. Additionally, on the one hand, the setting on the left of the neutral vowel may not influence its behavior. That is, a language with an active neutral ([[N]F]) will always have an [...N]F] pattern: [[BN]F], [[FN]F], [[N]F], that is [[BN]F], *[[FN]B], *[[N]B]: Type e. Similarly, a language with a passive neutral ([[N]B]) will always have the [[...N]B] pattern: [[BN]B], [[FN]B], [[N]B], that is *[[BN]F], [[FN]B], [[N]B]: Type d.

On the other hand, it is possible that the setting on the left of the neutral vowel influences whether assimilation takes place on the right of the neutral vowel. A back setting on the left of the active neutral vowel can "deactivate" it: [[BN]B], [[FN]F], [[N]F], that is *[[BN]F], *[[FN]B], *[[N]B]: Type a. Similarly, a front setting on the

7. On the name of the dialect, see 3.2.

left of a passive neutral vowel can "activate" it: [[BN]B], [[FN]F], [[N]B], that is *[[BN]F], *[[FN]B], [[N]B]: Type b.

Type g ([[BN]F], [[FN]B], *[[N]B] – [[BN]F], [[FN]B], [[N]F]) is unlikely, because neutral vowels are active by default, they are "deactivated" by a front, and not a back setting on their left. Type h ([[BN]F], [[FN]B], [[N]B] ) represents the opposite case: the passive neutral vowel is activated by a back and not a front setting on its left.

Type f ([[BN]F], *[[FN]B], [[N]B] – [[BN]F], [[FN]F], [[N]B]) is strange, since its passive neutral vowel is activated by both a back and a front setting on its left, although the back setting could only have an opposite effect. Type c (*[[BN]F], [[FN]B], *[[N]B] – [[BN]B], [[FN]B], [[N]F]) is unlikely, since although neutral vowels are active by default, they are "deactivated" by both front and back settings on the left of them.

Table 2 includes the short characterization of the neutral vowel and how its behavior is modified by the setting on the left. It is clear that those types are excluded in which a front left setting deactivates an active neutral vowel or a back left setting activates a passive one.

| | | [[BN]F] | [[FN]B] | [[N]B] | active/ passive | (de)activated by |
|---|---|---|---|---|---|---|
| a. | Finnish | * | * | * | active | back |
| b. | Uyghur, W Estonian | * | * | ✓ | passive | front |
| c. | (unattested) | * | ✓ | * | active | front, back |
| d. | "Enarve Veps", Mulgi | * | ✓ | ✓ | passive | – |
| e. | Khanty, NE Estonian | ✓ | * | * | active | – |
| f. | (unattested) | ✓ | * | ✓ | passive | back, front |
| g. | (unattested) | ✓ | ✓ | * | active | front |
| h. | (unattested) | ✓ | ✓ | ✓ | passive | back |

*Table 2.* The types of disharmony: a reinterpretation of the parameters of K&P (226).

## 2.3. Criticism of the typology of Kiparsky and Pajusalu

Rebrus & Törkenczy (2016), when reflecting on K&P, argue that neutrality is not categorical but gradual. While K&P (219) define neutrality as not undergoing VH, Rebrus & Törkenczy (2016: 240) state that neutrality can manifest itself in three different ways. For the demonstration of the three types, they use formulas similar to those of K&P. First, a vowel can be unbiased as a target, i.e. it is invariant, not affected by VH ([[B]N] & [[F]N]). Secondly, it can be unbiased as a trigger with respect to

another source, i.e. it can be transparent ([[BN]B] & [[FN]F]). Finally, it can be an unbiased trigger as a source, i.e. antiharmonic ([[N]B]). Moreover, they stress that all of these patterns may be subject to variation. They generally accept the typology of K&P, but they claim that additional types with variation should be included between the types established earlier. In addition, based on data taken from Hungarian, they assert that the behavior of different vowels of the same language can belong to different categories of the typology.

In this paper, it will be argued that many factors referred to by Rebrus & Törkenczy (2016) are crucial in the vowel harmonies of languages K&P's typology is based on. By all accounts, K&P have never received criticism in relation to their data and the analysis based on them. The only exception that can be mentioned is Nevins (2010: 215), who notes that the analysis of Eastern Khanty VH presented by K&P is inconsistent with the data presented elsewhere. However, Nevins does not attempt to clarify the reasons for this inconsistency.

Most importantly, although variation and above all vacillation play a huge role in harmony, they are ignored by K&P. In addition, they pay no attention to the size and the nature of harmonic domains. Additionally, it cannot be left unmentioned that their references to their sources are sometimes philologically inexact, and as a result, they spread misleading information on the languages and dialects they discuss.

## 3. Type d: *[[BN]F], [[FN]B], [[N]B]

In the typology of K&P, Type d can be briefly characterized as the type in which neutral vowels, despite being phonetically front, are always followed by back vowels. For derivational phonologies, this type can be problematic. If [back] is supposed to be the marked feature, it seems that the feature is spread by an element which does not have it (a [–back] N spreads [+back] to harmonic vowels). If [front] is supposed to be the marked feature, the case is more simple: neutral vowels do not spread their [+front] feature. Naturally, this kind of analysis also includes that harmonic vowels are back by default.

This section focuses on Mulgi harmony. In the first subsection, the claims of K&P will be confronted with the statements and data of their only mentioned source, Tanning (1961). Most importantly, it will be argued that two of the three typological parameters mentioned are inapplicable to Mulgi, since the harmonic domain in Mulgi is rarely longer than two syllables. Moreover, it will be claimed that Mulgi is not simply an [[N]B] language. In addition, in the following subsection, the question of Veps will be touched upon, which is typologically identical with Mulgi according to K&P. It will be demonstrated that Veps (more exactly its southern dialect) is a better example of the type than Mulgi, but even there it must be due to the nature of the domain rather than to the behavior of the neutral vowels. In subsection 3, the possibility of type [[FN]B], *[[BN]F], *[[N]B] will be questioned.

## 3.1. Mulgi vowel harmony

Estonian has two major dialect groups, sometimes considered to be two separate languages: Northern and Southern. Historically they had developed into relatively distant branches of Finnic languages, though in the last centuries they have become more similar to each other through contact (Laakso 2001: 204–205, 207). As for VH, Southern Estonian variants exhibit it, but most of the Northern Estonian dialects do not (see Wiik 1988: 157). However, the loss of VH in Northern Estonian is a relatively new phenomenon, and some (mostly peripheral) variants of Northern Estonian have preserved VH to some extent. The strength of VH – which is a complex phenomenon including such seemingly independent factors like the number of harmonizing vowels, the maximal length of the harmonic domain, the proportion of the harmonic forms in vacillating forms, etc. – also varies between the Southern Estonian dialects. In general, VH is stronger in the south (Võru and Seto dialects) and weaker in the north (Tartu and Mulgi dialects).

Mulgi is a Southern Estonian dialect, which can be considered as a transition zone towards the Northern Estonian dialects. This dialect has almost 10,000 speakers today. Mulgi exhibits a limited front/back VH. The vowel system of Mulgi is similar to that of Standard Estonian (Table 3.).

| | front | | back | |
|---|---|---|---|---|
| | unrounded | rounded | unrounded | rounded |
| high | /i/ | /y/ | | /u/ |
| mid | /e/ | /ø/ | /ɘ/ | /o/ |
| low | /æ/ | | /ɑ/ | |

*Table 3.* The vowel system of Mulgi (Tanning 1961: 27–36, 2004: 44–66)

These vowels all occur in initial syllables. In non-initial syllables, [ĕ] also occurs as an allophone of /ɑ/ (or /æ/), see the details below. However, /ø/ and /ɘ/ never occur in non-initial syllables, and /o/ is also very rare in that position. Due to VH, /y/ and /u/ on the one hand, and /æ/ and /ɑ/, on the other, show alternation. Vowels /i/ and /e/ can be considered neutral in that they can stand both after back and front vowels. (Mulgi also has long vowels and diphthongs, but they mostly occur in initial syllables and do not behave differently from short vowels in harmony; therefore, they will not be discussed in detail.)

In K&P, there are three statements on Mulgi. On page 221, they write the following: "In Southern Vepsian (Wiik 1989) and in the South Estonian Mulgi dialect (Tanning 1961: 33), *u* is neutral after vowels of unlike height ([…ä…u… ] versus *[…ä…ü… ]) but harmonic otherwise (*[…u…ü… ], *[…ü…u…]), whereas *a* is always harmonic." This statement is complemented by another one in a footnote: "However, *a* is retained after the neutral vowel *i*, as in *minnas* 'go' (pres.pass.), except

in the context of palatalized consonants (e.g., Transl.Pl. *iļļä-ksi* 'quietly')."[8] This latter claim is practically repeated in the table on page 226: the checkmark in the column of the [[i]a] ([[N]B]) parameter means that neutral vowels are followed by the back counterparts of harmonic vowels. Finally, the checkmark under the [[äi]a] ([[FN]B]) parameter shows that neutral vowels are not transparent for fronting in Mulgi.

The only work on Mulgi to which K&P refer is *Mulgi murdetekstid* (Mulgi Dialect Texts) by Salme Tanning (1961). The book contains a 37-page-long description of the dialect and 180 pages of texts. However, the statements of K&P and the claims and data in Tanning (1961) are not always in agreement. In the following three subsubsections, the three statements of K&P will be confronted with the description and data of Tanning.

### 3.1.1. High rounded vowel as a target

K&P (221) state that high rounded vowels in non-initial syllables undergo vowel harmony only if the trigger in the previous syllable is also high and rounded (and, of course, front, that is, /y/) – in any other case, the high rounded vowel must be back, that is, /u/. They refer to Tanning (1961: 33). However, Tanning says nothing similar there (or elsewhere). On the contrary, in the same place data contradicting K&P's claim can also be found. In two examples, /y/ stands after /æ/: /læhyksen/ 'near', /jæːny/ 'stay/remain:PST.PTCP'. There is also an example where /y/ follows an /ø/: /løːny/ 'hit:PST.PTCP'. In one example, the second-syllable high rounded vowel is phonetically neither front nor back after /y/: [synʈunu] (?/syntynu/, ?/syntunu/)[9] 'be. born:PST.PTCP'.[10]

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8. The transcription of these examples is a puzzle. By all probability, *minnas* is a Mulgi form from Tanning (1961: 33) where it occurs in the form *miňnaś* (Finno-Ugric or Setälä-transcription, ~ IPA [minˑasˑ]), while *iļļä-ksi* cannot be a Mulgi form, since in Mulgi there was a /ks/ > /sː/ shift, as the form [minˑɑsˑ] shows. Based on the indicated sources, it should be Veps from Wiik (1989), although the exact source could not be identified. Anyway, Wiik uses an apostrophe after the consonant mark indicating palatalization, so it should be *il'l'ä-ksi* in his transcription, which corresponds to the traditional Finno-Ugric transcription (which should be *ilʹlʹä-ksi* if it is typographically possible). The use of *ļ* to indicate a palatal lateral is typical for Latvian and Livonian orthography but very unusual for transcription elsewhere in Finnic – and it is unconventional in the literature on general phonology.
9. Attention has to be drawn to the statement "only lexically contrastive vowels participate in vowel harmony, or, to put it in another way, lexical harmony is typically structure-preserving, in the sense that it introduces no new vowel types" (K&P 218). Contrary to this claim, data on Finnic variants show plenty of examples of centrally realized vowels at the boundary of the harmonic domain. Wiik (1988: 192) claims that these kinds of intermediate realizations are typical for languages with decaying vowel harmony.
10. One year after the publication of Tanning (1961), Salme Tanning died. One year after the publication of K&P, based on her 1953 dissertation for the degree of Candidate of Sciences, a description of the Karksi subdialect was published (Tanning 2004). The book was edited by Karl Pajusalu. In this book, Tanning (2004, 60) states, "Vokaal *ü* on püsinud teises silbis, kui esisilbis on *ä*, *e* või *ü*", that is, "The vowel *ü* in the second syllable has remained when there is a vowel *ä*, *e* or *ü* in the initial syllable." This claim strongly contradicts the statement of K&P.

Examining the texts published in Tanning (1961),[11] one can find that second-syllable /y/ vowels are quite frequent after first syllable /y/ vowels and rare in all other cases. Although /ø/ is rare, when it occurs, it is often followed by /y/ instead of /u/: /løːny/ 'hit:PST.PTCP' (16, 38, 39 – the numbers always refer to the number of the text in which the form occurs), /søːny/ 'eat:PST.PTCP' (53); along with /løːnu/ 'hit:PST.PTCP' (39, 128), [lʏːdus] 'hit:PASS)' (127) , [sʏːnuvĕ] (136) (eat:QUOT). It is not easy to decide whether height or roundedness promotes harmony. The problem is further complicated by the fact that long /øː/ (similarly to other long mid vowels) is often realized higher than the short /ø/, or even as a high vowel: [ʏː] or [yː]. In these cases, the trigger is phonologically mid, but phonetically high(er).[12] Moreover, sporadic examples can be found in which second-syllable /y/ vowels follow front syllable /e/: /esːy/ 'get.lost:PST.PTCP', (53), /tenːy/ 'doːPST.PTCP' (58, 66). It must be concluded that K&P's statement on high rounded targets is false.

In addition, it must be highlighted that even Tanning (1961: 33) states something which is incompatible with her own data. Although she claims that /y/ does not occur after the second syllable, the following are some cases when it does (and not just after /y/): /kysyny/ 'ask:PST.PTCP' (5, 16), /elæny/ 'live:PST.PTCP' (6, 62), /væsyny/ 'tire:PST.PTCP' (29), /kylyny/ 'sow:PST.PTCP' (52), /syntyny/) 'be.born:PST.PTCP' (87) (and maybe more). It seems that the occurrence of /y/ in the third syllable is strongly discouraged, but not strictly prohibited. The low number of examples does not give us the opportunity to make distinctions between the subdialects.

### 3.1.2. Harmonicity slopes

As the examples show, there is vacillation in these forms in the Mulgi dialect: 'tire:PST.PTCP' can be /væsyny/, /væsynu/ or /væsunu/. Individual word forms suggest that the harmonic domain is the whole word (or, at least, three syllables), two syllables, and that there is no harmony at all, respectively. Based on the presented Mulgi forms, it is impossible to answer the question of how long the harmonic domain in Mulgi is.

Generally, the *harmonic domain* is understood as a domain in which harmonic vowels must belong to the same harmonic class. According to this idea, the domain is "flat", which means that (in similar circumstances) it is equally probable that any of the vowels will belong to the same class as the prominent vowel (e.g. the first one).

In Mulgi, the case is different. It seems that a front vowel can be followed by both front /y/ and back /u/. One cannot predict whether a non-initial high rounded vowel will be front or back, one can just speak about the probability of being front or back (harmonic or disharmonic). The value of probability highly depends on the quality of the

11. By all accounts, these texts are not available in an electronic format. Therefore, all the following examples from the texts were looked up manually. Since the probability of missing relevant data is high, no statistics of the observed patterns will be presented.

12. Interestingly, at the bottom of page 222, K&P mention a possible distinction between /æ/ on the one hand and /y/ and /ø/ on the other hand.

trigger. Even if it is suggested that the probability of a given first-syllable vowel being followed by a vowel belonging to the same harmonic class is the same as the probability of the same vowel in the second syllable being followed by a harmonic vowel, it will be less and less probable by every syllable whose vowel belongs to the same harmonic class as the first one. That is, if a front-harmonic vowel is followed by a front-harmonic vowel in half of the cases, a front-harmonic vowel should be found only in a quarter of the cases in the third syllable. The form [synt̪unu] 'be.born:PST.PTCP' even suggests that the submissive feature can fade subphonemically.

I will refer to these "domains" by the term *harmonicity slopes* without strict boundaries, but with a syllable-by-syllable decreasing probability of being harmonic. The fact that harmonic vowels can be followed by harmonic vowels belonging to the other harmonic class in adjacent syllables, and more often in syllables further from the initial ones, is a clear sign of a harmonicity slope. Additionally, harmonicity slopes can be spoken about even when only neutral vowels can be followed by both back and front vowels, but one of these is more and more dominant syllable-by-syllable (and probably the only possibility after some syllables). The length of harmonicity slopes can be defined by their minimal and maximal length. The presented examples suggest that in Mulgi, a harmonicity slope has no minimal length (cf. /løːnu/ 'hit:PST.PTCP'), and it rarely reaches the third syllable (although nothing excludes it being longer).

### 3.1.3. Are the neutral vowels transparent in Mulgi?

According to K&P, Mulgi is a *[[BN]F], [[FN]B] language, that is, neutral vowels do not spread harmony themselves, and what is more, they are not transparent to front harmony. At first sight, the latter seems to be counterintuitive, since neutral vowels are phonetically front: it is not clear why frontness disappears in the third syllable. To explain this, K&P use the already-mentioned **ä, *ö, *ü* constraint. However, if it is ranked higher than the AGR(BACK) constraint, not only [[FN]B] will be possible but [[F]B] as well. Therefore, they introduce two other constraints: Generalized MH,[13] according to which "a domain may not contain both a vowel marked for F and a vowel disharmonic for F", and Core MH, according to which "a vowel may not be both marked for F and disharmonic for F"[14] (harmonic front neutral vowels are marked for F, but neutral vowels – although they are phonetically front – are not). That is, when Generalized MH is ranked higher than **ä, *ö, *ü*, the result is a *[[FN]B] language, in the opposite case, a [[FN]B] language. (However, when Core MH is ranked higher than **ä, *ö, *ü*, there is no harmony.)

Tanning (1961: 33) states that a change, typical for Mulgi, can be observed, mostly in the Halliste and Karksi subdialects, and to a lesser extent in the Paistu and Helme subdialects: in the third and further syllables, /ɑ/ and /æ/ became /e/ or [ĕ]. In

13. MH stands for Marked Harmony. It is marked, since otherwise low or rounded front vowels are unfavored in non-initial syllables.
14. Here, F stands for *feature*.

the Tarvastu subdialect, an /æ/ > /ɑ/ change is observable, although /æ/ could also remain.[15]

Moreover, a few years earlier, even Pajusalu (1998: 235) claimed that /æ/ and /ɑ/ do not occur beyond the second syllable in the Karksi subdialect[16] (Figure 1).

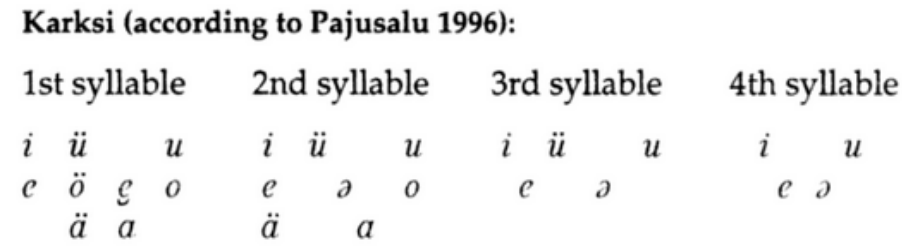


*Figure 1*. Vowels attested in different syllables in the Karksi subdialect (Pajusalu 1998: 235)

This piece of information is crucial for the present analysis for the following reasons. As it has been presented above, /y/ is very rare in the third syllable (and no examples for it were found in further syllables), and /u/ occurs there also after front-harmonic vowels. This means that the only alternation that remains for us is the /æ/ : /ɑ/ alternation to examine the behavior of VH beyond the second syllable. However, if these vowels do not occur in this position at all, one cannot confirm any statements on their distribution. If just /ɑ/ occurs, it means that not only is [[FN]B] allowed but [[FF]B] as well. The only way to interpret this fact (together with Tanning's – not absolutely justified – statement that /y/ does not occur beyond the second syllable) is that the length of the harmonic domain in Mulgi is not longer than two syllables (i.e. in both cases above, B is outside the domain). Consequently, even if [[FN]B] is allowed, it does not say anything about the behavior of neutral vowels, or even about VH (except for the fact that the domain of harmony does not reach the third syllable).

15. Although the phrasing of Tanning is a bit obscure, it is clear from the data that the /æ/ > /ɑ/ change is typical for Paistu and Helme subdialects as well, only the change /ɑ/, /æ/ > /e/, [ĕ] is less observable in them.

16. Lindström and Pajusalu (2003) offer interesting vowel statistics on Estonian dialects based on digitized dialectal texts. On page 255, a table shows the percentage of vowels in the fourth syllable in different dialects. In almost all other dialects except for Setu, the percentage of /ɑ/ is around 25% (in Setu it is around 15%), while in Mulgi it is considerably lower, 5%. There are bigger differences in the percentage of /e/, but it is usually around 50% in the northern dialects and around 25% in the southern ones – 38.7% in the Tartu dialect, which is, similarly to Mulgi, a southern dialect contacting the northern ones. However, in Mulgi the percentage of /e/ is over 70%. The percentage of /æ/ is very low in all the dialects, from zero (in the Insular dialects) to 5.5% (in the North-Eastern dialects). In Mulgi, it is 1.5%. Since the material consisted of 196 vowels (the least of all dialects), this means that there are 10 /ɑ/s and three /æ/s. Lindström and Pajusalu (2003: 255) state that the "fourth syllable [...] in Estonian dialects is always part of a suffix", but nothing more is given on the context of these vowels. Since the corpus also contains texts from the Tarvastu subdialect (Lindström & Pajusalu 2003: 243), maybe they all come from that. Unfortunately, Lindström and Pajusalu (2003) do not present statistics on harmonic patterns, and, by all accounts, no other publications do.

The texts published in Tanning (1961) partially qualify these observations. In the Karksi subdialect, no words in which a third-syllable /ɑ/ follows a second-syllable back vowel (that is /ɑ/ or /u/) were found. In the Helme dialect, only one was found, in the Halliste and Paistu dialects, 8 and 7, respectively. This means that, contrary to the statement of Tanning (1961: 33), /ɑ/, /æ/ > /e/, [ĕ] seems to be less typical for the Halliste than the Helme subdialect. In the Tarvastu subdialect, just in the first texts there are more examples for /ɑ/ beyond the second syllable than in the rest of the subdialects.

Looking for a third-syllable /ɑ/ after a neutral vowel (that is /i/ or /e/) shows a very similar result. One lexeme (stem) was found in the Karksi subdialect, namely /kɑtrinɑ/ ~ /kɑtːɑrinɑ/ 'Kate' (48) –, but this can be considered a recent loanword. Two examples were identified from the Helme subdialect, 7–8 examples from the Halliste and Paistu subdialects and plenty of them in the Tarvastu subdialect.

There are just a handful of examples in which third-syllable /ɑ/ is preceded by a front-harmonic vowel, namely /æ/. No examples were found in the Karksi, Halliste and Helme subdialects. One appeared in the Paistu subdialect: /vetæjɑ/ 'deliverer' (97), and two in the Tarvastu subdialect: /ketrætːɑ/ 'without wheel (of the spinning machine)' (98), /ketræmɑ/ 'to spin' (98). One could suggest that the rarity of the examples can be explained by the rarity of front-harmonic vowels in the second syllable. However, this would predict that the third-syllable /æ/ following a front-harmonic vowel will be rare as well.

In fact, it is rare, but more frequent than a third-syllable /ɑ/ in the same position (in some cases, also after /y/). There are no examples from the Karksi and Halliste subdialects, but there are three from the Helme subdialect: /kevæjæst/ 'spring:ELA' (121), /kypæræ/ 'hat:GEN' (124),[17] /vetæmæst/ 'pull:SUP:ELA' (136). There are six and eight examples from the Paistu and Tarvastu subdialects, respectively. This means that if there is a harmonic front vowel in the second syllable and a harmonic (front or back) vowel in the third syllable, then the whole (trisyllabic) word will be rather harmonic than disharmonic. Consequently, it cannot be simply concluded that the harmonic domain is just two syllables long. If there is a possibility, the harmonic domain may reach the third syllable, when a low harmonic vowel is found in the third syllable instead of the neutral /e/ ([ĕ]) expected in Mulgi.

The case is similar when the occurrence of /æ/ after a neutral vowel is examined. No examples were found in the Karksi and Helme subdialects. However, there are

17. One can argue that these kinds of words are out of the scope of K&P's typology, because the final /æ/ of /kypæræ/ belongs to the stem, since it is practically present in all oblique cases of the word. On the contrary, if this form is compared with the singular nominative /kypær/, it has to be concluded that the final /æ/ is the segment which differentiates the two forms. Therefore, it can be analyzed as a suffix (see the issue of Mulgi /piːm/ 'cottage.cheese (NOM.SG)' : /piːmæ/ 'cottage.cheese:GEN.SG or :PART.SG' below). In any case, similar examples are cited here for two reasons. Firstly, there does not seem to be any difference between these and the undoubtedly suffixed forms. Additionally, their difference from the expected form cannot be explained only by analyzing them as a part of the stem. Secondly, the number of the relevant examples is so low that it is expedient to consider these forms as well.

three examples from the Halliste subdialect: /ylevæn/ ‘up, on the top’ (58), /es pyːnetːæ/ ‘NEG.PST catch’ (67), /kitsevæst/ ‘narrow:ELA’ (67); five from the Paistu subdialect: /venelæne/ ‘Russian’ (83), /lysːetːæ/ ‘express.milk:INF’ (91), /minevæ/ ‘past:GEN.SG (go:PRS.PTCP:GEN.SG)’ (92), /ei mæletːæ/ ‘NEG remember’ (92), /ytːesːæ/ ‘9’ (93); and two from the Tarvastu subdialect: /kæːnetːæs/ ‘turn:PST.3SG’ (104), /ylevæl/ ‘up, on the top’ (117). Note that three of these examples, /kitsevæst/, /venelæne/ and /minevæ/ show that front-harmonic vowels may occur in the third syllable even after following two neutral vowels.

To sum up, with a low vowel in the third syllable, the [[FN]B] (or [[FN]F]) pattern cannot be attested in the Karksi subdialect. In the Tarvastu subdialect, both [[FN]B] and [[FN]F] patterns occur, and a third-syllable back-suffix vowel can also follow a front-harmonic stem vowel. Moreover, even identical word forms occur with both back and front suffix vowels in both cases: /ketræmɑ/ (98) ~ /ketræmæ/ (106) ‘spin:SUP’, /ylevɑn/ (99) ~ /ylevæl/ (117) ‘up, on the top’. This can also be considered as a harmonicity slope: the domain may reach the third syllable, but does not necessarily do so. All the other subdialects are transitional in this respect: low vowels are highly dispreferred after the second syllable, but when they sporadically occur, they are attested in all kinds of patterns like in Tarvastu.

Since although the [[FN]B] pattern, and also the [[FF]B] and [[NF]B] patterns occur both with high rounded and low vowels, the backness of the suffix vowel has nothing to do with the neutrality of the second vowel of the stem. As a consequence, the explanation of K&P cannot be accepted, according to which [[FN]B] patterns appear due to a specific ranking of restrictions. Additionally, since the pattern [[FN]F] and even the pattern [[NN]F] occur, one cannot agree with any analysis according to which such patterns with back and front suffix vowels are mutually exclusive.

### 3.1.4. Do neutral vowels trigger front harmony?

K&P (225) stress that they focus on derived environments, that is, in cases when the last vowel is a part of a suffix. Up to now, three-syllable forms were discussed and the main point of the argumentation was that the third syllable typically lies outside the domain of VH. As a consequence, it has not been crucial up to this point whether the vowel of the third syllable belongs to the same morpheme as the preceding one or not. Now the attention is turned to the [[N]B] parameter. Since the second syllable undoubtedly belongs to the harmonic domain, it is a crucial problem whether the vowel in the second syllable belongs to the stem or not. However, in Estonian, it is not always easy to decide if it does or does not.

Originally in Finnic (and in, for example, in Finnish even today), the most typical nominal root is bisyllabic and vowel-final. A few centuries ago, this was the case in Estonian as well. However, later, in most of the cases (when the first syllable was closed or when it contained a long vowel or a diphthong), the second vowel was dropped if the root was unsuffixed, but it was not deleted before a suffix. Due to other changes, some of the original suffixes were also dropped, and now the presence of the

one-time root final vowel distinguishes different forms of the paradigm, e.g. Mulgi /piːm/ 'cottage.cheese[18] (NOM.SG)' : /piːmæ/ 'cottage.cheese:GEN.SG or :PART.SG[19])'. On the one hand, one can argue that due to the aforementioned changes, morpheme boundaries in Estonian were shifted and now /æ/ is a suffix in the given example. On the other hand, the quality of the vowel in these forms (and many others) is not predictable, that is, it is a lexical property of the stem what vowel appears in its suffixed forms. Based on this fact, one can argue that the vowel in question is actually part of the stem, which does not surface in an unsuffixed form. Both analyses are acceptable, and it is not self-evident which is better; and therefore, these cases will be simply ignored.

CV stems with short vowels occur only in pronouns. Therefore, in open word classes, this decision limits the examination to CV stems with long vowels and CVC stems when they are followed by a suffix beginning with a consonant . It seems that in most of these cases the suffix contains a front vowel: /minːæ/ 'go:INF' (2, 12, 49, 52, 56, 58, 62, 65, 93, 136), /viːjæ/ 'carry:INF' (6), /setæ/ 'it:PART' (7, etc.), /tetːæ/ 'do:INF' (7, 53, 66, 89), /mitæki/ 'something:PART (what:PART:some)' (8, 49, 84), /viːmæ/ 'carry:SUP' (8, 83), /tenːy/ 'do:PST.PTCP' (41, 42, 49, 58, 66), /tetːæn/ 'do:INF:INE' (52), [kɪːtmæ] 'cook:SUP' (53), /siːjæ/ 'here (< DEM:ILL)' (53), [tɪːnmæ] 'serve:SUP' (55, 67), /viːny/ 'carry:PST.PTCP' (55), [kɪːmæ] 'boil:SUP' (82, 125), /viːmæn/ 'carry:SUP:INE' (83), /ketæki/ 'someone:PART (who:PART:some)' (98), /niːtmæ/ 'mow:SUP', (99), /riːsmæ/ 'rake:SUP' (99), /pesːæ/ 'wash:INF' (102, 125), /tetːæs/ 'do:PASS' (7, 53, 66, 89), /sinːæ/ 'there (< DEM:ILL)' (127, 129). However, there are cases when the suffix contains a back vowel: /sinːɑ/ 'there, DEM:ILL' (100), /minːasː/ 'go:PASS' (105). It can be concluded that although the [[N]B] pattern exists, the [[N]F] pattern dominates. The result can be qualified if it is taken into consideration that the data were collected manually, and the harmonic patterns are more salient. Nonetheless, the most important result here is that [[N]F] is an existing and not even rare pattern in Mulgi, which contradicts the analysis of K&P.

## 3.2. A brief look at Veps

Among other Finnic examples, K&P refer to varieties of Veps.[20] According to the table on page 219, Enarv Veps[21] has /u/ : /y/ and /ɑ/ : /æ/ alternation due to VH, while (all other? certain?) Veps dial[ect(s)] has/have just /ɑ/ : /æ/. However, looking at the map in

18. See Tanning (1961: 126).
19. Actually, the two features are distinguished by suprasegmental features left unindicated here because of their irrelevance to VH.
20. At the beginning of their article, K&P use the term *Veps*, later they switch to *Vepsian*. In this paper, the form *Veps* will be used.
21. K&P use the term *Enarve Veps(ian)*. According to different sources (Arukask 2016: 238; Mullonen 1994: 58, 112–113; 2013: 135; VRS 2016), the Veps name of the settlement is *Enaŕv* (sometimes typeset in a simplified way, without diacritic marks as *Enarv*). The Russian name of it is *Vonozero (Вонозеро)*. *Enarve* seems to be an Estonian form. The form *Enarv* will be used in this paper.

Wiik (1989: 66), it becomes obvious that all Veps dialects exhibit /u/ : /y/ alternation at least in a very weak form (sporadically).

It has already been cited that "in Southern Vepsian (Wiik 1989) and in the South Estonian Mulgi dialect (Tanning 1961: 33), *u* is neutral after vowels of unlike height ([…ä…u… ] versus *[…ä…ü… ]) but harmonic otherwise (*[…u…ü… ], *[…ü…u…]), whereas *a* is always harmonic" (K&P 211). However, Wiik (1989: 65) makes a distinction between the cases when the trigger of the fronting of the high rounded vowel is, on the one hand, /y/ or /ø/ and, on the other hand /æ/. Comparing the maps 9 and 10 on pages 66 and 67, one can see that for rounded vowels, /y/ and /ø/ are strong triggers in Southern Veps, while /æ/ does not function as a trigger at all. Vowels /y/ and /ø/ are never contrasted as triggers anywhere in Wiik (1989).[22] However, the above-mentioned maps and the comments belonging to them on page 68 claim – contradicting also the approach of Wiik – that, at least in the Ladva dialect, /æ/ is a stronger trigger for rounded vowels than /y/ and /ø/. This fact suggests that – if Wiik's data are reliable – the phonetic differences of vowels may generally determine their "strength" in VH, but they do not provide a strict, irrevocable hierarchy for all languages or variants.

In the table on page 226 in K&P, Enarv Veps and Mulgi belong to the same type, that is *[[BN]F], [[FN]B] and [[N]B]. As for *[[BN]F], [[FN]B] in Enarv Veps, map 7 in Wiik (1989: 60) shows that the harmonic domain reaches the third syllable. However, map 8 (Wiik 1989: 61) shows that Enarv Veps also has a harmonicity slope: it is a rare case that the domain covers the fourth syllable as well. According to the comments (Wiik 1989: 63–64), there are specific limitations for that: there has to be a consonant "easily oversteppable for [vowel] assimilation" (usually /h/), and both the trigger and the target should be /æ/. (Wiik interprets it as a full assimilation, although it seems that only the low (unrounded) /ɑ/ can be the target – therefore, assimilation can spread only frontness.) The case is very similar in Southern Veps, but the harmonic domain just occasionally covers the third syllable in other dialects, and (except for an isolated zone between Enarv and Southern Veps) it never reaches the fourth syllable. Wiik (1989: 99) also emphasizes that there is no harmonic alternation after second-syllable neutral vowels.

As for [[N]B], maps 5 and 6 (Wiik 1989: 58–59) are relevant here. Unfortunately, there is no information on morphological boundaries here, but it must be supposed that disharmony (namely /ɑ/ following /i/ or /e/) is more frequent morpheme internally.[23] Both maps show that in Enarv Veps (and generally in Western Central Veps) harmonic forms slightly prevail in forms both with initial-syllable /i/ and /e/ vowels, and this means that Enarv Veps is not a clearly [[N]B] language. However, Southern

22. Remember again the suggestion about the distinction between /æ/ on the one hand and /y/ and /ø/ on the other hand in K&P (222).

23. This assumption comes from the fact that if suffixation is consistent, then variation must emerge from the lexicalized stems. It is unlikely that stems follow the same pattern, but there is variation in suffixation. It is also unlikely that there is no harmony in suffixation, but it is not rare inside stems (similarly K&P: 224). The most probable scenarios are that, on the one hand, as in Finnish, suffixation regularly obeys the rules of harmony, while there are exceptional stems, on the other hand, both suffixation and stems show variation.

Veps lacks [[N]F] (and [NF]) forms completely, so it would be a much better example for the given type. Moreover, K&P ignore the fact – mentioned by Wiik (1989: 62) and emphasized by Rebrus & Törkenczy (2016) based on Hungarian – that different neutral vowels can behave differently: in the zone between Enarv and Southern Veps, and partly in Central Veps (Nažamjärv), /æ/ may occur after a first-syllable /e/, but not after a first-syllable /i/.

It has been demonstrated that if not Enarv, than Southern Veps seems to be a perfect example of the type *[[BN]F], [[FN]B] and [[N]B]. However, even in this case, it is questionable whether these patterns really emerge because of the nature of the neutral vowels. Even Wiik (1989: 99–100) argues that this is a result of the shortening of the harmonic domain. According to him, in Veps the harmonic domain is not the whole word, but only two syllables. Every syllable starts a new domain, so domains are overlapping: in the third syllable of the word /[$_1$væ[$_2$ri]$_1$ʃtɑ]$_2$/ there can be no /æ/, since there is no bisyllabic stem like */[riʃtæ]/. However, this analysis cannot explain why */[$_1$væ[$_2$ri]$_1$ʃtæ]$_2$/ cannot occur in those dialects, where /[riʃtæ]/ at least sporadically occurs. Moreover, it cannot explain why harmonic alternations can be observed in the third syllable more or less regularly, but in the fourth syllable only exceptionally.

Another explanation by Wiik (1988: 192), which can be called the "torch battery metaphor", seems to be more appropriate. According to this, the first (stressed) vowel is like an electric torch which lights the word (with the light of frontness). The weakening of harmony is like when the battery has discharged: 1) the light is not so strong anymore, some places remain in darkness (the domain is shortening); 2) some places remain in semi-darkness ("intermediate" vowel realizations); and 3) the torch functions only intermittently (vacillation).

This metaphor can be expanded: the vowels of the non-initial syllables are like lenses. These lenses are not opaque or transparent, but rather translucent to different degrees. In the same way, the light of different torch-vowels can be of different strength. However, the strength of the light or the degree of translucency of the different vowels can be calculated from statistical data, but they are not encoded as abstract representations in the linguistic knowledge of the language user. It is rather likely that the production of the speaker depends on the statistics of the forms heard by them, and on the patterns of these forms (as presented in Ernestus & Baayen 2011: 388–400, under the name of exemplar-based and hybrid models), and it is subject to a continuous shift.

In the case of /væriʃtɑ/ and /riʃtɑ/ ~ /riʃtæ/, the explanation could be that the possibility of a third-syllable harmonic front vowel after a neutral one depends on the frequency of the third-syllable harmonic front vowels in general (that is, primarily after harmonic front vowels), and the frequency of front-harmonic vowels after neutral vowels in general (that is, primarily in the second syllable). Since in Veps neither of these frequencies is high (and the latter is generally very low), the total effect is that front-harmonic vowels never occur after a neutral vowel beyond the second syllable.

### 3.3. Are there front neutral vowels "opaque to frontness"?

It seems that both examples of K&P for the *[[BN]F], [[FN]B], [[N]B] type, i.e. Mulgi and Veps, are problematic. Even if Southern Veps shows these patterns, the regularities of VH do not seem to result from the behavior of the neutral vowels, but rather from the harmonicity slope. It is even questionable whether a language without a harmonicity slope can show the [[FN]B] pattern. If a stem in a language exhibiting front/back harmony contains a front-harmonic vowel and a phonetically front neutral vowel, the only reason to attach a back allomorph of a harmonic suffix can be some preference of back vowels (generally, or at least in the given position, that is, in suffixes or in non-initial syllables, etc.). This can be manifested in a shorter harmonic domain (minimally two syllables, as generally in Mulgi) or a harmonicity slope. This means that the harmonic domain has no strict boundaries, but harmony is less and less probable by every added syllable.

Of course, theoretically, one cannot exclude the existence of a language in which front neutral vowels behave similarly to back-harmonic vowels as triggers. In any event, K&P do not mention a proper example of this type, and no better example appears to turn up either.

## 4. Type e: [[BN]F], *[[FN]B], *[[N]B]

In the typology of K&P, Type e can be briefly characterized as the type in which neutral vowels are always followed by front vowels. In derivational phonologies, if it is supposed that [front] is the marked feature, it must be supposed that neutral vowels spread their [+front] feature in the same way as front-harmonic vowels do. If it is supposed that [back] is the marked feature, one can say that neutral vowels are [–back], so they cannot spread the [+back] feature. Naturally, this kind of analysis also includes that harmonic vowels are front by default.

In this section, Khanty harmony will be examined and it will be pointed out that K&P misidentify the dialect they speak about. It will be demonstrated that none of the Eastern Khanty dialects show those typological parameters that K&P assign to them. K&P's source of data, i.e. Vértes (1977), is actually on Southern Khanty. Although the typological parameters K&P assign to Eastern Khanty fit Southern Khanty superficially, in fact, it is the properties of the harmonic domain rather than the behavior of the neutral vowels that are responsible for the emergence of the given patterns. In the second subsection, the other example for [[BN]F] *[[FN]B] *[[N]B] languages, Northeastern Estonian will be examined. In the third subsection, it will be argued that despite the problems with K&P's examples, this is an existing type, and Standard Hill Mari will be presented as a perfect example and Erzya as a less perfect one.

## 4.1. Khanty vowel harmony

In footnote 10 of K&P (226), the main sources of the data on the typologically categorized languages are enumerated. Here, among other claims, it is stated that the source of the Khanty data is "the painstaking descriptive study of vowel harmony in Karjalainen's Eastern Khanty texts by Vértes (1977)". However, Vértes (1977: 7) clearly declares that her work is based on Karjalainen's Southern Khanty texts ("südostjakische Texte") and on pages 26 and 27 she briefly describes the differences between the dialects of Khanty from the point of view of VH. There she also refers to Tereshkin (1961) and Gulya (1966) as the relevant sources on Eastern Khanty VH. Unfortunately, the issue is not a simple typo: the word *Khanty* occurs 18 times in K&P and of this, 14 times in the phrase *Eastern Khanty* (and as just *Khanty* in the remaining cases). The confusion of the two dialects can be really misleading,[24] since the existence of VH in the easternmost Khanty dialects was well known even before Vértes's research, and – unfortunately – the results of Vértes did not get much attention even after they were published. For example, Tereshkin (1966: 349), Sal (1976: 267),[25] Comrie (1981: 106; 1988: 455), Honti[26] (1998: 332) and Sipos (1999: 1135; 2000: 281; 2004: 253) state that front/back VH is present in Eastern Khanty or more exactly they refer to the Vakh and/or Vasyugan dialect, but they do not mention Southern Khanty.

The dialectal problems are even more complicated. Khanty dialects are usually divided into three main groups, which differ so much from each other that, despite forming a dialect continuum, they could be treated as different languages. Southern Khanty was spoken along the River Irtysh and its tributaries, and around the influx of the Irtysh into the Ob (near Khanty-Mansiysk). This dialect group became extinct before the middle of the 20th century. Northern dialects were and partially are still spoken along the Ob and its tributaries downstream from the one-time Southern Khanty territory, while Eastern Khanty is spoken along the Ob and its tributaries upstream of that.

From the point of view of VH, the picture is even more complicated. Northern Khanty never exhibited VH since it was documented (cf. from the middle of the 19th century). Southern Khanty exhibited VH at the turn of the 19th and 20th century, but

24. Nevins (2010: 215) noticed that the analysis of K&P does not correspond to the Eastern Khanty data presented elsewhere, but he did not go back to the source of K&P, Vértes (1977), where he could have easily found the reason for the differences.

25. Although this description was published before Vértes (1977), Sal could have been familiar with Vértes (1969). By all accounts, this is the only description which also mentions VH in the northernmost Khanty variant, the Obdorsk dialect. According to this, the domain of VH is limited to the first two syllables. No source of this claim is given.

26. Honti (1984: 25) mentions that Proto-Khanty had front/back VH, but he does not state anything on the documented stages. However, on the page before, he presents the vowel systems of non-initial syllables in the different dialects, and one can observe front/back opposition in Vakh–Vasyugan Khanty and in certain Surgut dialects (and definitely not in the Southern dialects). He also remarks that VH is in decay in some (!) Surgut dialects. The only clue to the fact that Vakh-Vasyugan Khanty has preserved VH is that no changes in its vowel system are presented which could lead to the loss of it.

later became extinct. Eastern Khanty can be divided into two groups, also due to VH. The western group, called Surgut Khanty, which was adjacent to Southern Khanty, exhibited VH at the turn of the 19th and 20th centuries, but this phenomenon was lost by the second half of the 20th century. The eastern group, Vakh–Vasyugan Khanty, still exhibits VH. However, the vowel harmonies attested in these variants differ from each other.

The following statements are made by K&P about Khanty:

1. In footnote 2 on page 218, they state that "in Eastern Khanty *ɨ and *õ are not phonemic, and do not undergo vowel harmony, but they arise as allophones of /i/ and /e/ by local assimilation in certain back contexts".[27] Khanty is mentioned here as an exception to their statement "only lexically contrastive vowels participate in vowel harmony, or, to put it another way, lexical harmony is typically structure-preserving, in the sense that it introduces no new vowel types". It is not clear, if Khanty [ɨ] and [ɘ] do not undergo VH, why Khanty is exceptional for the structure-preserving nature of VH. Later, on page 226, the statement is repeated: "in Eastern Khanty, an optional postlexical local assimilation process creates back ɨ, õ, without interacting with harmony in any way".

2. According to the table on page 226, Khanty is a [[BN]F] *[[FN]B] *[[N]B] language.

3. On page 227, this is interpreted as "Finnish and Eastern Khanty […] tolerate these marked vowels [/æ/, /y/, /ø/] in order to eliminate such disharmonic combinations".

All other statements are basically identical with these. In the following three sub-subsections, the most relevant properties of the three different kinds of vowel harmonies in different Khanty dialects will be surveyed. The claims of K&P will be compared with the data available on these variants. Since the statements of K&P are based on Vértes (1977), Southern Khanty is naturally the most relevant variant here. Nonetheless, it is not without interest to examine what other dialects show.

#### 4.1.1. Vakh–Vasyugan Khanty

The most relevant descriptions of the Vakh dialect are Tereshkin (1961) and Gulya (1966). A similarly detailed description of Vasyugan Khanty (Filchenko 2007) was published after the publication of K&P. All the three grammars present the vowel system similarly (see Table 4).

27. The use of asterisks before the letters indicating the two vowels remains unclear, since these vowels are attested in Southern Khanty, independently of whether they are analyzed as independent phonemes or allophones of front vowels.

| | Front | | Back | |
|---|---|---|---|---|
| | Unrounded | Rounded | Unrounded | Rounded |
| High | /i/ | /y/ | /ɨ/ | /u/ |
| Mid | /e/ | /ø/ | | /o/ |
| Low | /æ/ | | /ɑ/ | |
| Reduced | /ĕ/ | /ø̆/ | /ɔ̆/ | /ŏ/ |

*Table 4*. The Vakh-Vasyugan Khanty vowel system (based on Tereskin 1961: 9; Gulya 1966: 23; Filchenko 2007: 1)

According to the descriptions, Vakh-Vasyugan Khanty has strict front/back harmony. All the vowels but /e/ have a harmonic counterpart (front or back).[28] Since /e/ occurs only in initial syllables, it is not a potential target of VH, and therefore, it cannot be considered neutral. Rounded vowels are rare in non-initial syllables, but similarly to all other vowels with front/back counterparts, they alternate due to VH (with the exception of /u/ in the passive marker -/uj/-): there are no neutral vowels in Vakh-Vasyugan Khanty. As a consequence, the typological parameters suggested by K&P, based on the behavior of neutral vowels, are not applicable to these dialects.

### 4.1.2. Surgut Khanty

According to the descriptions from the second half of the 20th century (Honti 1977, 1978a, 1978b; Honti & Rusvai 1977; Csepregi 1998: 9, 11), Surgut Khanty has completely lost VH. However, Csepregi (1998: 11) states that the vowels of non-initial syllables differ due to the frontness or backness of the first syllable phonetically. Nevertheless, she emphasizes that this is irrelevant from the phonological point of view.[29] If this claim is valid, it seems that contemporary Surgut Khanty is also an exception to the general rule mentioned by K&P (2013: 218) that VH cannot be allophonic.

Vértes (1999) gives a detailed description of Surgut Khanty VH (more precisely, the VH of its Yugan subdialect) based on the texts by Paasonen. The supposed vowel system is presented in Table 5.

28. Gulya (1966: 26) argues that [ĕ] : [ɔ̆] alternating in non-initial syllables is an extra phoneme, not identical with initial syllable /ĕ/ and /ɔ̆/ (which is pronounced rather [ă]). It is difficult to agree with his argumentation –, but in any event this is not a crucial issue here.

29. It seems that Csepregi's statement is based on the fact that the different phonetic quality (frontness/backness) of these vowels is never contrastive. By contrast, for K&P (218) non-allophonic harmony means that "it introduces no new vowel types". The two definitions differ from each other: in a harmony where all vowels occurring in non-initial syllables can be identified with a certain phoneme occurring in the first syllable (and vice versa) are non-allophonic for K&P. However, if harmony is exceptionless, it would be allophonic according to the arguments of Csepregi (since vowels of the non-initial syllables are never contrastive due to the harmonic feature: only the vowel of the initial syllable can be contrastive).

| | Front | | Back | |
|---|---|---|---|---|
| | Unrounded | Rounded | Unrounded | Rounded |
| High | /i/ | /y/ | /ɨ/ | /u/ |
| Mid | /e/ | | | /o/ |
| Low | /æ/ | | | /ɒ/ |
| Reduced non-low | /ĕ/ | /ø̆/ | | /ŏ/ |
| Reduced low | /æ̆/ | | /ɑ̆/ | |

*Table 5*. The vowel system of the Yugan subdialect of Surgut Khanty (based on Vértes 1999 and Honti 1984: 20)

The low back vowel /ɒ/ is phonetically rounded in the first syllable only. In further syllables, it is realized as [ɑ]. In order to avoid the risk of ambiguity, it will be written as /ɑ/ in non-initial syllables even in phonemic transcription. Since /ɒ/ and /æ/ are well distinguishable due to the difference in their roundedness, /æ/ is realized as a central vowel [ɐ] or [ä]. As a consequence, /ɑ/ and /æ/ must have been difficult to distinguish from each other for fieldworkers.

Rounded vowels, /æ̆/ and /ɑ̆/ are not attested in non-initial syllables (except for forms containing the invariant passive marker /oj/). Some suffixes show /ɑ/ : /æ/ or [ə̆] : /ĕ/ alternation, while others occur only with /ĕ/.[30] Stems with a front vowel in the first syllable are always harmonic (the /o/ of the passive marker does not count as a harmonic vowel). Stems with a back vowel in the first syllable can be followed both by /ə̆/ and /ĕ/, both by /ɨ/ : /i/, but out of the /ɑ/ : /æ/ pair, it is always /ɑ/ that appears. Beginning from the third syllable, alternants /ɨ/ : /i/ and especially /ə̆/ : /ĕ/ display bias towards the front counterparts, yet even in these cases they behave transparently, and they are followed by /ɑ/ when preceded by a back vowel. The only vowel occurring in non-initial syllables and showing no alternation is /e/. This is thus the only vowel which can be considered neutral. However, according to Vértes (1999: 134), both BNF and BNB patterns occur; the same word forms occur with both patterns (vacillation). Although Vértes does not indicate morpheme boundaries, it is clear that her examples are not monomorphemic: [muˑʲkeˑmɑˑt] ~ [muˑʲkeˑmæˑt] ‘riddle:INST’ from [muˑʲkeˑm] ‘riddle’.

### 4.1.3. Southern Khanty

Vértes (1977) gives a very detailed survey of Southern Khanty VH based on the texts of Karjalainen. Her material consists of 8469 words, out of which 893 (10.5%) are disharmonic (Vértes 1977: 59). However, about 20% of the non-disharmonic words are monosyllabic (cf. Vértes 1977: 100); and since one can speak about harmonic or

30. It remains unclear whether [ə̆] can be treated as an allophone of /ɑ̆/ in Surgut Khanty, as it is in Southern Khanty according to Vértes (see below). In this case, it has to be accepted that there is a phonemically not perfect alternating pair (/ɑ̆/ [ə̆] : /ĕ/), or [ĕ] in non-initial syllables should be treated as an allophone of /æ̆/, not /ĕ/. In the latter case, there is an alternating pair (/ɑ̆/ [ə̆] : /æ̆/ [ĕ]).

disharmonic words only if they contain at least two vowels, monosyllabic words are better ignored. 893 of around 6775 polysyllabic words are disharmonic, a proportion of about 13%. The vowel system is presented in Table 6.

| | Front | | Back | |
|---|---|---|---|---|
| | Unrounded | Rounded | Unrounded | Rounded |
| High | /i/ | /y/ | /ɨ/ | /u/ |
| Mid | /e/ | /ø/ | /ɘ/ | /o/ |
| Low | /æ/ | | /ɑ/ | |
| Reduced non-low | /ĕ/ | /ŏ/ | /ə̆/ | /ŏ/ |
| Reduced low | /ă/ | | [ă] | |

*Table 6.* The vowel system of Southern Khanty (according to Vértes 1977: 158[31])

However, later Vértes (1985: 4–5) states that [ă] is just a variant of /ə̆/ occurring in initial syllables. On the contrary, /ă/ is a phoneme which is opposed to /ĕ/, but it occurs only in some subdialects described by Paasonen (so not in the material of Vértes 1977, cf. 30–33); and therefore, it can be ignored here. It goes without saying that Vértes reckons with phonemic /ɨ/ and /ɘ/, though she notes that these occur first of all "in non-initial syllables, inflectional and derivational suffixes" and are rare in initial syllables (Vértes 1985: 5).

Based on K&P, one should think that Vértes (1977) reckons with allophonic [ɨ] and [ɘ]. However, the opposite is true: she argues against treating these as allophones. She claims that although /ɘ/ is very rare in the first syllable and first-syllable /ɨ/ does not occur in her material, based on the dictionary of Karjalainen (Karjalainen & Toivonen 1948), it can occur in some lexemes (Vértes 1977: 111). She refers to Vértes (1969: 55): the examples cited there show that [ɨ] occurs in forms where one cannot explain it by the existence of a neighboring velar consonant (though the stem can also occur with a first-syllable [i], often in the very same subdialect). Therefore, Vértes (1977: 112) states that /ɨ/ is a phoneme having a weak position. On the contrary, the table in Vértes (1969: 46) shows that first-syllable [ɘ] occurs before velars. However, Vértes (1977: 161–162) argues that when a phoneme is rare, it is normal that it cannot be found in many kinds of contexts, and it is no wonder if these contexts are similar. Obviously, the arguments of Vértes are rather weak and, not surprisingly, they were subject to debate (see Sauer 1984 and Vértes 1984).

Nonetheless, it is clear that K&P are not right when they say that [ɨ] and [ɘ] do not undergo VH. In fact, in non-initial syllables they can occur only when they are preceded by a back vowel, although [i] and [e] can also occur after back vowels: [ɨ]/[i] and [ɘ]/[e] undergo harmony optionally ([ɨ] and [ɘ] do not occur after front vowels).

31. This is different from Honti (1984: 21), who indicates no /ŏ/ (except for one subdialect), but who contrasts /ĕ/ and /ă/ in all dialects.

In any case: if /ɨ/ and /ə/ are analyzed as phonemes, they must be treated as harmonic vowels. From this analysis another problem arises: are /i/ and /e/ harmonic or neutral? If they are harmonic, they cannot be N in the cases like [[BN]]F], [[FN]B] or [[N]B], and it has to be explained how they can follow back vowels at all. If they are neutral, one cannot accept the explanation of K&P (218) that neutral vowels are neutral because of the structure-preserving nature of VH, that is, because VH cannot introduce new phonemes. Therefore, in the following, only the analysis according to which [ɨ] and [ə] are the allophones of /i/ and /e/, respectively, will be discussed: these allophones emerge due to VH in non-initial syllables, and due to velar consonants in initial syllables (at least [ə], as once again, first-syllable /ɨ/ does not occur in Vértes's (1977) material).

In non-initial syllables, rounded vowels do not occur, except for /o/ in the past tense singular ending -/ot/. Vowels /ɑ/ and /æ/, on the one hand, vowels /ə̃/ and /ĕ/, on the other hand, alternate due to VH. However, there is a tendency towards choosing front vowels. Word forms with a front vowel in the initial syllable usually do not contain back vowels: the only exceptions are past tense singular forms with -/ot/.[32] By contrast, word forms with a back vowel in the first syllable can contain front vowels for several reasons. A switch from back to front vowels can occur:

- after a palatal consonant;
- if an [i] or [e] appears when [ɨ] or [ə] is expected;
- after [ɨ] or [ə];
- due to the fact that the dual marker always contains /ĕ/, never /ə̃/;
- when /æ/ occurs instead of /ɑ/, especially in the last syllable.

In addition, the switch after [ɨ] and [ə] is not obligatory, which confirms that they can also serve as back triggers, although the number of such word forms is relatively low. There are some cases observed when [i] and [e] are both preceded and followed by back vowels, but according to Vértes (1977: 69–72), these are typos.

The switch from back to front can be followed by a switch from front to back only in the case of the past tense singular ending -/ot/. There are no word forms longer than four syllables with back vowels, while five- and six-syllable forms with only front vowels exist (although their proportion is under 1%; see Vértes 1977: 100–101, 103). While the share of word forms with front vowels exclusively is about 60%, the proportion of them with back vowels is about 30%. The statistics show that front vowels are twice as frequent as back ones in the first syllable. About 3–4% of the word forms exhibit a switch from front to back vowel (/o/) and about 6–7% from back to front vowels. These numbers show that there is a tendency to choose front rather than back vowels from the first syllable and even later on. The most obvious reason is that due

32. Since foreign words and compounds are cross-linguistically general exceptions to VH, these will be ignored here. However, statistics cited from Vértes contain them, although only the number of the foreign stems and compounds with both front and back vowels is known (under 1%, 1977: 67).

to the higher frequency of front vowels in the first syllable, front vowels are more frequent even in non-initial syllables; and therefore, they tend to occur there even when preceded by back vowels (and when the circumstances make it easier).

K&P completely ignore these facts, although they are in conflict with their proposed constraint *ä, *ö, *ü: in Southern Khanty, /æ/ is preferred to /ɑ/. Maybe it is also related to the fact that /æ/ is phonetically rather centralized and /ɑ/ is more closed, but this seems to be irrelevant here. The preference for front vowels can explain why the structure [[BN]F] is possible but [[FN]B] is not.

Moreover, since there are word forms like [jəxət] 'river:3S', [jəxəm] 'river:1S', [jəxənɐ] 'river:LOC', [jəxəjæ] 'river:LAT' (Vértes 1977: 68, 71 – in the last three cases without glossing), it must be supposed that they are also suffixed by allophones with [ɑ] like *[jəxtɑ][33] 'river:ABE' (instead of *[jəxtæ]). Although no explicit examples are given, the figures and tables (Vértes 1977: 31–32) confirm this assumption. Consequently, on a phonemic level, */jextɑ/ 'river:ABE' shows that the structure [[N]B] is allowed in Southern Khanty. Accepting that [[N]B] is allowed (interpreting "allowed" in its original sense, that is "may occur", but not "necessarily obligatory"), Southern Khanty should be classified as Type f by K&P (226), unattested up to now.

## 4.2. A brief look at Northeastern Estonian

As for the data on Northeastern Estonian, K&P (226, footnote 10) refer to Must (1995: esp. 22). Must uses the term *kirderannikumurre*, literally 'dialect of the northeastern coast', translated into English usually as the Northeastern Coastal dialect, cf. Laakso (2001: 207), Söderman (1996), Viitso (1998: 98), etc. According to the descriptions of Must (1987: 135; 1995: 22) and the map of Wiik (1988: 157), /y/ : /u/ alternation is typical for the westernmost and easternmost of the dialect area (east of Tallinn and around Narva), while /æ/ : /ɑ/ alternation is typical for the westernmost area and for the whole eastern half area. The phenomenon K&P are especially interested in, namely the occurrence of /æ/ after /i/ or /e/ following a back vowel, is said to be attested in the eastern third of the territory, that is, principally, in the area between the Gulf of Finland and the northern shores of Lake Peipus. Lindström and Pajusalu (2003: 242) mark the "North-Eastern" dialect at the same place and distinguish it from Coastal (on the coast from Tallinn to the northeast of Rakvere). Similarly to Khanty, Northeastern Estonian is classified as an [[BN]F], *[[FN]B], *[[N]B] language. The vowel system is basically the same as in Mulgi. There are considerable differences between the subdialects, some of which lack VH. All of the subdialects exhibiting VH have /ɑ/ : /æ/ alternation, but some also display alternations /u/ : /y/ and /o/ : /ø/ (Must 1987: 135–140; Must 1995: 22–23; Wiik 1988: 61, 117, 121, 125), too.

At a place referred by K&P (226, footnote 10), Must (1995: esp. 22) states that in some subdialects /æ/ *may* occur in words with back vowels, if there is an /i/ or /e/ in the

33. The asterisk here refers to the fact that the form is unattested (and not that impossible – the main point here is that this is a possible structure).

preceding syllable. This does not mean that /ɑ/ is excluded in this position, so both patterns [[BN]F] and [[BN]B] occur (while other subdialects are strictly *[[BN]F]). Must (1987: 137) emphasizes that /æ/ after /i/ and /e/ occurs sporadically and individually in these kinds of words. Nonetheless, examples in the following pages show that it is also true for /y/ and /ø/ in dialects where also non-low vowels undergo harmony. Moreover, it seems to be true that the front counterparts of harmonic vowel pairs occur after stems containing neutral vowel(s) only. These facts suggest that at least some variants of Northeastern Estonian really belong to the [[BN]F] (although not *[[BN]B]), *[[FN]B], *[[N]B] type. In addition, there is no data suggesting that variants with /i/ and /e/ triggering front harmony have a harmonicity slope towards (i. e. favoring) front vowels (front vowels never follow back vowels immediately, as they do in Southern Khanty).[34]

Nonetheless, the ranking of constraints in a way as presented in K&P is not able to explain these kinds of vacillation, and it seems to be unlikely that any variant of Northeastern Estonian has or had a strictly regular VH with categorically opaque /i/ and /e/.

## 4.3. Languages with opaque front neutral vowels

As it has been demonstrated, both examples given by K&P for the [[BN]F], *[[FN]B], *[[N]B] type, Khanty and Northeastern Estonian, represent the given type doubtfully (only if variation is disregarded). This fact raises the question of whether this type exists at all. Nonetheless, as opposed to the case of the *[[BN]F], [[FN]B], [[N]B] type, it is quite easily imaginable that phonetically front neutral vowels behave similarly to front-harmonic vowels.

In fact, it is not so difficult to find such a language, even a language more closely related to the Finnic languages than Khanty. In Standard Hill Mari, /i/ and /e/ are neutral vowels in the sense that they can follow any vowel (as it is defined by K&P 219), but they must be followed by front vowels: /kuɣilæ/ (*/kuɣilɑ/) ‘birch forest’, /oʃeměnæm/ (*/oʃemə̆nɑm/) ‘turn.white:PST:1SG’. The harmony is so regular that in Hill Mari orthography /æ/ and /ə/ were marked by a distinct letter only in initial syllables (‹ä› and ‹ӹ›, respectively), and in subsequent syllables they were written in the same way as /ɑ/ and /ə̆/ (‹а› and ‹ы›, respectively), because – except for some marginal cases – it was clear from the preceding letters which phoneme they indicate (Alhoniemi 1985: 31–33). However, recent publications (e.g. Savatkova 2008) mark these phonemes differently in non-initial syllables as well.

34. It is not clear whether there is a harmonicity slope towards (favoring) back vowels. Some of the examples as /syømæt:ɑ/ ‘without eating’, /kyt:ætɑ/ ‘heat:INF’, /peræmɑst/ ‘after’, /kyntæmɑ/ ‘plough:sup’, /æmælɑne/ ‘spider’, etc. suggest that there may be such a tendency. However, the first two examples come from the Lüganuse subdialect, in which also forms with /æ/ (even in the fourth or fifth syllable!) after /i/ or /e/ following one or more than one back vowel occur.

An even more closely related language, Erzya can be another, albeit perhaps slightly less convincing example. Standard Erzya[35] has a five-vowel system (/i/, /e/, /u/, /o/, /ɑ/) and exhibits an /e/ : /o/ alternation according to VH. The remaining three vowels can occur after any vowel (although /u/ occurs in non-initial syllables only exceptionally), but, by default, the back ones must not be followed by /e/, and /i/ must not be followed by /o/ (at least in suffixation; lexicalized exceptions may occur). The Erzya case is less convincing, because VH in Erzya considerably differs from the vowel harmonies described by K&P. First of all, the alternating vowels are not simply front/back counterparts but also differ in roundedness. Secondly, neutral vowels can be both front and back.[36] Last but not least, in Erzya harmony the palatalization of consonants plays a key role. Along with the cases when only vowels affect each other (/kudo-so-nzo/ 'house-INE-3SG' : /velʲe-se-nze/ 'village-INE-3SG'), there are also cases when consonants affect vowels (/kɑl̲-**o**nʲ/ 'fish-GEN' : /kɑlʲ̲-**e**nʲ/ 'willow-GEN' or /kɑl̲-s**o**/ 'fish-INE' : /kɑlʲ̲-s**e**/ 'willow-INE'), or vowels affect consonants (/kudo̲-**t**/ 'house-PL' : /velʲe̲-**t**ʲ/ 'village-PL' – triggers responsible for suffix alternation are underlined, targets are set in bold). Therefore, it is rather a consonant-vowel harmony than a VH: palatalized vowels can override the default case described above. Nonetheless, the Standard Erzya case shows that neutral vowels, which are not harmonic as targets, can behave as harmonic vowels when they are triggers.

## 5. Discussion

In this section, the conclusions drawn will be summed up. In the first subsection, the focus is on the problem of why the Optimality Theory analysis offered by K&P cannot be applied to the languages discussed. In the second subsection, an alternative interpretation of the parameters of K&P will be suggested and confronted with the facts of the languages discussed. The third subsection summarizes the main takeaways of the paper.

35. Vowel harmonies in Erzya dialects may considerably differ from the Standard. On harmony in Standard Erzya, see e.g. Bartens (1999: 66–70), Keresztes (1990: 37, 54–56; 2011: 22–23) and Zaicz (1998: 189). For an overview on the diversity of harmonic patterns in dialects, see e.g. Rueter (2016: 124–127).

36. Parameters like [[BN]F], [[FN]B], [[N]B] mean totally different things when N is phonetically back or when N is phonetically front, and it is even unlikely that they will behave similarly. Some of the earlier mentioned languages can also be analyzed as having back neutral vowels. For example, Vakh-Vasyugan Khanty /u/, turn-of-the-century Surgut Khanty /o/ can be analyzed as back neutral vowels, since they can stand after both back and front vowels. However, these occur only exceptionally (in one morpheme, the passive marker), while Erzya /ɑ/ is very common, not limited to a small group of morphemes.

## 5.1. Uniformity and variation

The core idea of K&P was to characterize vowel (dis)harmony with the parameters [[BN]F], [[FN]B] and [[N]B]. When these parameters are presented, the question is whether these are prohibited or allowed. The parameters seem to be well applicable, since one can find these patterns in a given language or not. Nonetheless, even this interpretation can lead to questions. Finnish is classified as an *[[N]B] language, despite forms like /vertɑ/ 'blood:PART', /mertɑ/ 'sea:PART' or /kiːtos/ 'thank (noun)' (cf. /kiːtːæː/ 'thank:INF') – see Hakulinen et al. (2004: §15–§16). Disharmonic foreign stems in which a back-harmonic vowel or vowels is/are followed by (phonetically front) neutral vowels show vacillation (Hakulinen et al. 2004: §17), although similar native stems are always suffixed with the back allomorphs of harmonizing suffixes. This makes us interpret *not allowed* as 'strongly dispreferred', 'only exceptionally occurs', etc. This kind of simplification is quite regular in linguistics.

However, the suggested Optimality Theory analysis modifies this interpretation. As a result of the different constraint rankings, [[BN]F], [[FN]B] and [[N]B] patterns are not simply prohibited or allowed, but prohibited or obligatory. While at the beginning, the proposal for parameters does not exclude the possibility that although [[N]F] is general, but along with those, plenty of examples for the [[N]B] pattern are attested. They can be even equally frequent. However, the Optimality Theory analysis suggests that patterns like [[N]F] and [[N]B] mutually exclude each other. Once again, in cases like Finnish, this statement can be loosened up in a way that patterns [[N]F] or [[N]B] are strongly preferred or dispreferred.

Still, all the languages examined above show some kind of variation. This variation, however, is different from that in Finnish, and it is also much more prevalent. Irregularity is very restricted and vacillation occurs only in foreign words, typically with a structure uncommon in Finnish, while vacillation is common with native words in the dialects discussed above.

The existence of variation is also emphasized in the sources of K&P. Wiik (1988: 76–80) explains how he counts the strength of a kind of VH: different dialects of Estonian are characterized by the percentage of harmonic forms in the group of potentially harmonic forms. A slightly different method is presented in Wiik (1989: 54), but it is also based on the range of actually and potentially harmonic forms. Wiik (1989: 69–72) even gives a numeric characterization of the strength of VH of Veps dialects. Both Tanning (1961: 33) and Must (1987: 135–140) show parallel examples with and without harmony. Vértes's (1977) entire approach to VH is statistical, and she presents a lot of parallel or quasi-parallel forms especially with /i/ and /e/ (sometimes /ɨ/ and /ə/; see 75–85), but also with /ɑ/ ~ /æ/ (88–93). Supposedly, it must have taken a great deal of effort for K&P to fit the example languages into the given categories. It was undoubtedly necessary to decide which pieces of data were relevant and which could be ignored, to make some statistics, etc. It also has to be admitted that virtually all widely used phonological theoretical frameworks are based on the presumption that a certain morphological form can have just one phonological implementation, and

therefore, the authors had little possibility to choose a framework which could also handle vacillation. Nonetheless, it is not only the details of the data analysis that are absent from their paper, but the reader is not informed about the fact that the classification of these languages is not self-evident either. The explanation would have been strongly required not only to justify their decisions, but also to facilitate the work of others to classify other languages. Undeniably, such a classification needs simplification. However, some cases raise doubts.

As for Mulgi, harmonic front vowels are extremely rare in the third syllable. An obvious way of simplification could be to ignore these cases and to say that the harmonic domain in Mulgi is the first two syllables of the word and, consequently, the parameters [[BN]F] and [[FN]B] cannot be applied. Nonetheless, K&P chose another way and they ignored the [[FN]F] patterns and took the [[FN]B] patterns as decisive (and they did not attribute any significance to the existence of [[FF]B] patterns). Maybe they had good reasons for that, but the reader is not informed about these.

As for Enarv Veps, maps 5 and 6 of Wiik (1989: 58–59) show that [[N]F] (or, at least, [[N]F] and [NF]) forms slightly prevail over [[N]B] ([[N]B] and [NB]) forms. This means that Enarv Veps is rather an *[[N]B] language.

In the case of (Southern, not Eastern) Khanty, it should have been at least mentioned that [[BN]B] and [[N]B] patterns may occur when a neutral vowel is realized by its back allophones. In addition, although it seems to be reasonable to analyze [ɨ] and [ɘ] as allophones of /i/ and /e/, respectively, it could have been more straightforward to mention that the referred source does not agree with that.

Speaking about Northeastern Estonian, although [[BN]F] patterns may occur in some subdialects, it seems to be less typical than [[BN]B]. Therefore, it is not clear why it was classified as a [[BN]F] language.

Moreover, the data of the example languages of K&P also show that the parameters given by them cannot be interpreted without considering the length and the nature of the harmonic domain. In Mulgi, the domain of harmony rarely reaches the third syllable. When interpreting the parameters [[BN]F] or [[FN]B], it has to be considered that even second-syllable front-harmonic vowels can be followed by back-harmonic ones, usually /u/ (neither /æ/ or /ɑ/ normally occur in that position, except for the Tarvastu subdialect).

In Enarv and Southern Veps, the harmonic domain can reach the third syllable, at least when it contains a low vowel. However, it rarely reaches the fourth syllable, so there is a clear harmonicity slope. Considering the behavior of different vowels, one must see that the slope does not begin after the third syllable: for example, rounded vowels do not undergo harmony in the third syllable. Rounded vowels do not undergo VH in the second syllable after a non-rounded vowel either in Southern Veps. This shows that vowels form a hierarchy as triggers: rounded vowels are the strongest, low /æ/ is weaker and neutral vowels are very or completely powerless (in Enarv and Southern Veps, respectively – in Enarv Veps, there is a difference even between /i/ and /e/).

The harmonicity slope in Southern Khanty is quite different: first of all, it gravitates towards front vowels; secondly, it is more smooth in the sense that there are no differences between vowels which are prohibited after a certain number of syllables. Although in Vértes's (1977) material back vowels do not occur after the fourth syllable, it does not seem to be a result of a strict prohibition of back vowels beginning from the fifth syllable. Rather, it is a consequence of the statistical improbability to find a back vowel so far from the first syllable (which is also based on the rarity of so long word forms and the relatively low proportion of back vowels – their frequency is half of that of the front vowels – in the first syllable). In Southern Khanty, /i/ and /e/ can be analyzed as neutral vowels in the sense that they undergo harmony only allophonically, that is, their realization is not identical with the default realization of any phoneme. Their neutrality is also reflected in the facts that they undergo harmony less often than other vowels and even if they undergo it, they spread harmony less often than harmonic vowels.

On the contrary, in Northeastern Estonian, where /i/ and /e/ can trigger the fronting of the following harmonic vowel, they do not have to trigger it inevitably, and there is no other way reported to switch from back vowels to front vowels. A harmonicity slope should be supposed only if the frequency of triggering were lower in the first syllable than in further syllables – however, such statistics are not available.

## 5.2. Explanation for the parameters

There are reasons to think that the existence of harmonicity slopes is not independent of the possibility of the types suggested by K&P. Neutral vowels are defined as vowels which do not undergo harmony (K&P: 219), which means that according to the definition, neutral vowels are those which behave in a neutral way on their left side. In languages belonging to Type a and Type b (*[[BN]F], *[[FN]B]), neutral vowels show a neutral nature also on their right, since they can be followed by both front and back vowels, depending on the vowels on their left. The difference between the two types is that in Type a, N behaves as a front vowel when it is not preceded by any other vowel, but in Type b, it behaves as a back vowel. (In Types g and h ([[BN]F], [[FN]B]), one would also find that neutral vowels behave neutrally on their both sides. However, they would have to be preceded and followed by vowels belonging to different harmonic classes. This would strongly contradict the principles of vowel harmony, no wonder it is not attested.)

In all the other types, neutral vowels behave as harmonic vowels on their right. Being front vowels, it is self-evident that neutral vowels can behave as front vowels: [[BN]F], *[[FN]B] – that is Types e and f. However, this kind of behavior is incompatible with the pattern [[N]B]; therefore, it is expected that Type f will not occur. For Type e, Standard Hill Mari is a perfect example. Based on (and it is important to stress, not according to) Vértes (1977), Southern (and not Eastern) Khanty cannot belong to this type for two reasons. On the one hand, neutral vowels may undergo vowel harmony at least subphonemically, and they can serve as triggers according to

their phonetic, not phonemic value. On the other hand, there is a general preference for front vowels. This means that at least in some specific cases, even back-harmonic vowels can be followed by front ones – the cases when neutral vowels do not undergo harmony, or their back allophones do not trigger harmony can be seen as two of these specific cases. Northeastern Estonian can rather be classified as a Type a language: although the pattern [[BN]F] occurs in some variants, it is not dominant.

It is rather problematic when neutral vowels, despite being phonetically front, behave as back vowels on their right (Types c and d: *[[BN]F], [[FN]B]). From a theoretical point of view, one would not expect these types of languages to occur. Of course, even if Type d occurs, one would expect that Type c cannot, because the parameter *[[N]B] is incompatible with the fact that N behaves like a back vowel. However, as it has been demonstrated, although [[FN]B] is more typical for Mulgi than [[FN]F] (at least where these patterns occur), [[N]F] seems to be more typical than [[N]B] – at least with a low target ([ɑ] : [æ]). Although the opposite is true for word forms with a rounded target ([u] : [y]), in these cases, it is also true for word forms with front-harmonic triggers (except for [y]). Therefore, these cases should be ignored (or explained with some extra factors). As a consequence, Mulgi seems to be rather a Type c than a Type d language. Of course, this has nothing to do with the constraint ranking suggested by K&P, but rather with the fact that front-harmonic vowels are strongly discouraged beginning from the third syllable in Mulgi. Mulgi is a dialect in which data with just sporadic examples suggest that the harmonic domain is not longer than two syllables. Therefore, it is also questionable whether one should classify it in a typology, in which two of the three parameters are based on the quality of the vowel in the third syllable. The problem is less striking, but it still exists for the Veps dialects.

Anyway, the facts mentioned above suggest that there are no languages with a strict [[FN]B] (that is, *[[FN]F]) parameter without a harmonicity slope towards back vowels. Phonetically, front neutral vowels are never opaque to frontness, although they may seem to be when frontness is discouraged for some other reason – in the discussed case, positionally. Contrarily, phonetically front neutral vowels can be opaque for backness, as in Standard Hill Mari. Nonetheless, the reason for the dominance of the [[BN]F] parameter can also be a general preference of harmonic vowels, as in Southern Khanty (where the same pattern can – although does not have to – occur even in the cases when the neutral vowel, phonetically front by default, is realized with its back allophone).

## 5.3. Conclusion

As it was demonstrated in Sections 2 and 3, there are considerable gaps between the characterization of the dialects referred to by K&P and the empirical data provided by their sources. A closer look showed that there are at least two important factors K&P ignored. One of these is that although these languages show variation in the patterns examined, their Optimality Theory analysis suggests that the given patterns must be

either obligatory or prohibited. The other missing factor is that most of the discussed dialects show a preference increasing syllable-by-syllable to one of the harmonic classes (Mulgi and Veps to back, Southern Khanty to front), called *harmonicity slope* in this paper. It must be stressed that the existence of harmonicity slopes is not my discovery, it had been basically sketched by one of the sources of K&P, Wiik (1988: 192) as the "torch battery metaphor". Additionally, for Southern Khanty, this phenomenon is, although less explicitly, described in Vértes (1977). Both vacillation and the signs of harmonicity slopes can be attested also with harmonic triggers, that is, the parameter *[[F]B], indicating that a language has (strictly regular) vowel harmony, is questionable for these languages. Since even harmonic vowels differ in their strength as triggers, neutral vowels seem to be the weakest triggers rather than a completely distinct category. Although it is possible that some of these gaps could have been bridged if K&P had shared the details of their data analysis with the readers, unfortunately, these details were not included in the paper, and neither, as it seems, were published later.

The typology of K&P is based on the assumption that phonetically front vowels being neutral on their left can be either neutral or harmonic on their right. In the former case, they are transparent. In the latter case, they can behave both like front- or back-harmonic vowels. Nonetheless, the existence of phonetically front neutral vowels behaving as back triggers is counterintuitive, and languages seemingly having these kinds of neutrals rather have harmonicity slopes preferring back vowels. As a consequence, it must be supposed that phonetically front vowels being neutral on their left can be either neutral or front-harmonic on their right (and even something between). However, it has to be kept in mind that the actually occurring and prohibited vowel patterns do not just depend on the nature of the neutral vowels, but also on the general preference for front or back vowels, which can grow by every syllable.

It must also be stressed that this typology must be improved, adjusted and verified based on much more empirical data: on considerably more languages and on much more detailed analyses thereof. To make different languages comparable, a well-articulated method is needed for simplifying the linguistic facts, to make it clear what can, should or must be ignored during the classification process.

## Abbreviations

Abbreviations not occurring in the LGR (2015):

| | |
|---|---|
| ATR | advanced tongue root |
| B | back-harmonic vowel |
| ELA | elative |
| F | front-harmonic vowel |
| ILL | illative |
| INE | inessive |
| INST | instructive |
| K&P | Kiparsky & Pajusalu (2003) |
| N | (phonetically front) neutral vowel |
| PART | partitive |
| RTR | retracted tongue root |
| SUP | supine |
| VH | vowel harmony |

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