Connected to this line of research are perception experiments, as suggested by our reviewers, testing the ability of Hungarian speakers to differentiate variably retracted transparent vowels.

6. Conclusion

The experiments reported in this study provide, for the first time, a systematic articulatory description of transparent vowels in a language with vowel harmony. The main result was that the harmonic type of a stem is realized as a sub-phonemic difference in the tongue body position of transparent vowels. Transparent vowels in the front-selecting stems are produced with the tongue body more advanced than the phonemically identical vowels that occur in back-selecting stems. Hence, transparent vowels do participate in vowel harmony at the phonetic level.

A striking property of the data was that even the vowels in isolated monosyllabic stems showed differences in articulation that correlate with their suffix choices. Thus, transparent vowels in monosyllabic stems selecting back suffixes were more retracted than phonemically identical vowels in monosyllabic stems selecting front suffixes. Crucially, these differences emerge from stems elicited in their un-suffixed forms.

Finally, we proposed that a plausible phonetic basis for transparency can be found in characteristics of the relation between articulation and acoustics of transparent vowels. The proposed phonetic basis allows one to relate a previously seemingly unrelated set of observations about the effect of rounding, height, and number of transparent vowels in vowel harmony. The proposed phonetic basis also makes specific predictions about data that can be obtained in future experiments. More broadly, the proposal is that the phonological behavior of transparent vowels can be better understood when the phonological patterning of these vowels is studied together with their articulatory and acoustic characteristics.

Acknowledgements

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Appendix A

A.1. List of stimuli for subjects ZZ and BU

<table>
<thead>
<tr>
<th>Back</th>
<th>Gloss</th>
<th>Front</th>
<th>Gloss</th>
<th>Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trisyllabic words</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/i/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>zafir-ban</td>
<td>sapphire</td>
<td>zefir-ben</td>
<td>zephyr</td>
<td>Iness.</td>
</tr>
<tr>
<td>zafir-ból</td>
<td>sapphire</td>
<td>zefir-ből</td>
<td>zephyr</td>
<td>Elat.</td>
</tr>
<tr>
<td>zűdit-ott</td>
<td>to hail</td>
<td>szédít-ett</td>
<td>to beguile</td>
<td>3rd Sg. past indef.</td>
</tr>
<tr>
<td>tompit-ő</td>
<td>attenuative</td>
<td>tömit-ő</td>
<td>obturating</td>
<td>adjunct. suff.</td>
</tr>
<tr>
<td>normativ-nél</td>
<td>normative</td>
<td>primitiv-nál</td>
<td>primitive</td>
<td>Adess.</td>
</tr>
<tr>
<td>passziv-hoz</td>
<td>passive</td>
<td>essziv-hez</td>
<td>essive</td>
<td>Allat.</td>
</tr>
<tr>
<td>Szólít-od</td>
<td>to address</td>
<td>bővit-ed</td>
<td>to let out</td>
<td>2nd Sg. def.</td>
</tr>
<tr>
<td>/i/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bácsi-ban</td>
<td>uncle</td>
<td>bécsi-ben</td>
<td>of Vienna</td>
<td>Iness.</td>
</tr>
<tr>
<td>buli-val</td>
<td>party</td>
<td>bili-vel</td>
<td>pot</td>
<td>Instr.</td>
</tr>
<tr>
<td>kocsi-tól</td>
<td>carriage</td>
<td>őcsi-től</td>
<td>buster</td>
<td>Abl.</td>
</tr>
<tr>
<td>polip-om</td>
<td>polyp</td>
<td>Filip-em</td>
<td>Filip</td>
<td>1st Sg poss.</td>
</tr>
</tbody>
</table>
szolid-nak solid rövid-nek short Dat.
bólint-ott to nod érint-ett to touch 3rd Sg. past indef.
Lutri-hoz lottery csitri-hez flapper Allat.

/szlit-

sztén-ban satín kretén-ben cretin Iness.
tányér-nál plate tenyér-nél palm Adess.
mále-hoz spoon filé-hez fillet Allat.
sassze-val shuffle esszé-vel essay Instr.
malé-ns stupid békés-en peaceful adject. suff.
ganész-ott be composetd intéz-ett manage 3rd Sg. past indef.
kadét-tól cadet bidé-től bidet Abl.

Back Front

Monosyllabic words

viv fence iv bow
hid bridge iz flavor
ır write hır rumor
vig cheerful mig while
sip whistle čim address
nyit open hisz believe
 cél aim szél wind
héj crust éj night

Frame sentence:
Azt mondom, hogy ____ és elismétlem azt, hogy ____ mégegyeszer. ‘I say ____ and I repeat ____ once again.’

Appendix B

B.1. List of stimuli for subject CK (pilot)

Trisyllabic & disyllabic words

<table>
<thead>
<tr>
<th>Back</th>
<th>Gloss</th>
<th>Front</th>
<th>Gloss</th>
<th>Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>zafir-ban</td>
<td>sapphire</td>
<td>zefir-ben</td>
<td>zephyr</td>
<td>Iness.</td>
</tr>
<tr>
<td>zafir-tól</td>
<td>sapphire</td>
<td>zefir-től</td>
<td>zephyr</td>
<td>Abl.</td>
</tr>
<tr>
<td>zafir-hoz</td>
<td>sapphire</td>
<td>zefir-hez</td>
<td>zephyr</td>
<td>Allat.</td>
</tr>
<tr>
<td>aktiv-ál</td>
<td>Active</td>
<td>beszív-el</td>
<td>to draw</td>
<td>Adj.</td>
</tr>
<tr>
<td>näv-ul</td>
<td>Naïve</td>
<td>bej-el</td>
<td>to lob</td>
<td>Adj.</td>
</tr>
<tr>
<td>masszív-val</td>
<td>massive</td>
<td>múszív-val</td>
<td>art. heart</td>
<td>Inst.</td>
</tr>
<tr>
<td>masszív-hoz</td>
<td>massive</td>
<td>múszív-hez</td>
<td>art. heart</td>
<td>Allat.</td>
</tr>
<tr>
<td>masszív-ba</td>
<td>massive</td>
<td>múszív-be</td>
<td>art. heart</td>
<td>Illat.</td>
</tr>
<tr>
<td>passzív-val</td>
<td>Passive</td>
<td>kőszív-val</td>
<td>heart of adamant</td>
<td>Inst.</td>
</tr>
<tr>
<td>passzív-hoz</td>
<td>Passive</td>
<td>kőszív-hez</td>
<td>heart of adamant</td>
<td>Allat.</td>
</tr>
<tr>
<td>züdít-ott</td>
<td>to hail</td>
<td>szédít-ett</td>
<td>to beguile</td>
<td>3rd Sg. past i ind.</td>
</tr>
<tr>
<td>jobbit-om</td>
<td>to ammend</td>
<td>kisebbit-em</td>
<td>to lessen</td>
<td>1st Sg. poss.</td>
</tr>
<tr>
<td>kábít-om</td>
<td>to daze</td>
<td>repit-em</td>
<td>to send</td>
<td>1st Sg. poss.</td>
</tr>
<tr>
<td>i</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>náci-val</td>
<td>Nazi</td>
<td>nőcici-vel</td>
<td>bimbo</td>
<td>Inst.</td>
</tr>
<tr>
<td>náci-ban</td>
<td>Nazi</td>
<td>nőcici-ben</td>
<td>bimbo</td>
<td>Iness.</td>
</tr>
</tbody>
</table>
náci-hoz
bácsi-val
bácsi-ban
bácsi-hoz
buli-val
buli-ban
cumi-ban
koci-tól
lutri-val
lutri-hoz
lutri-ba
mázli-val
nyuszi-tól
polip-on
polip-om
cuclitam
kap-ni
lop-ni
e
acél-nak
affér-ban
bode-től
kávé-val
soltész-ből
tányér-hoz
málé-val
mále-hoz
sasszé-val
sasszé-ből
sasszé-hoz
csáé-val
csáé-ban
csáé-hoz
vám-ért
hám-ért
púp-ért
e
totem-mal
totem-től
hárem-ban
hárem-mal
hárem-on
hárem-ba
hárem-ből
hárem-hoz

Azt mondom, hogy ____ és elismétel azt, hogy ____ mégegszer.
‘I say ____ and I repeat ____ once again.’
Ekkor azt láttam, hogy ____ akkor pedig azt láttam, hogy ____ mégegszer.
‘Now I see ____ and then I read ____ once again.’