Absolute neutralization in Modern Hebrew? An experimental study

Introduction. In a controversial analysis, Chomsky and Halle (1968) proposed that the underlying representation of the English word "nightingale" contains /x/, a velar fricative that never surfaces in the language. This possibility – that speakers can represent distinct phonological categories without phonetic evidence – was dubbed "absolute neutralization", and has been under debate at least since Kiparsky (1968). In addition to learnability challenges, an absolute neutralization rule challenges Optimality Theory, in which derivations are in principle surface-true. This talk presents an experimental study of a case from the majority dialect of Modern Hebrew, for which the simplest analysis assumes an abstract pharyngeal consonant that never surfaces. This case allows an experimental inquiry into whether speakers can learn abstract categories from the distribution, because: (i) phonological evidence is abundant and exceptionless,[1] and (ii) speakers of a minority dialect maintain the category distinction. The latter fact allows a direct comparison between speakers' ability to construct an underlying category based on phonetic evidence compared with distributional evidence alone. The preliminary results of an experimental study show a difference in performance between majority and minority dialect speakers, suggesting that it is at the very least not possible for every speaker to acquire absolute neutralization patterns.

Background. In Modern Hebrew, the historical pharyngeal triggers vowel lowering, which can be followed by progressive vowel harmony of an unstressed mid vowel (not productive in Modern Hebrew, but retained in some templates). In the context of the Segholates, a class of nouns with penultimate stress (~75% of stems in Hebrew bear final stress), this results in two loci of lowering, presented below as produced in the minority non-merged dialect.

1.	CéCeC	→ C_1**á**C_2**a**C_3 if C_2 = /ħ/	e.g. láħat͡s 'stress' (cf. méχes 'costums')
		→ C_1éC_2**a**C_3 if C_3 = /ħ/	e.g. mélaħ 'salt' (cf. méleχ 'king')
2.	CaCéCet	*No alternation if C_2 = /ħ/*	e.g. *ʃaħáfat (attested: ʃaħéfet 'tuberculosis')
		→ C_1aC_2**á**C_3**a**t if C_3 = /ħ/	e.g. sapáħat 'skin desease' (cf. rakeχet 'rickets')

In the majority dialect, the voiceless pharyngeal fricative [ħ] has merged with the voiceless uvular fricative/trill, such that both are produced as [χ]/[ʀ̥]. Nonetheless, speakers of the majority dialect have clear intuitions related to the alternations presented in (1) and (2): they confirm that *téla**χ*** and *talá**χ**at* are possible nonwords, but **téla**ʁ̥*** and *talá**ʁ̥**at* are not. In the absolute neutralization analysis, that is because [télaχ] can be analyzed as /teleħ/→|télaħ|→[télaχ]. Alternatively, this knowledge can be represented as phonotactic constraints, e.g., {**CéCaC*$_3$*, **CaCáC*$_3$*at* | *C*$_3$≠χ}. A third possibility is an OO-correspondence analysis, in which the existence of [a] in one template conditions the appearance of [a] in the other. The goal of the study is to tease apart between these three analyses.

Design. I used a novel language game paradigm, based on the idea of extending the "pharyngeal" status of a consonant from one Segholate template to another, where the pharyngeal triggers an alternation *in a different position.* If the historical pharyngeal is learned from the distribution, a lowering alternation in a novel word should be evidence for the pharyngeal's existence, and other associated alternations should apply accordingly. The game makes use of the nominal templates in (1) and (2). (1) is a common template (includes hundreds of items), and while (2) includes only approximately 90 items, it has semantic coherence, as it includes primarily, though not only, deseases. Both templates accept novel coinages. In the teaching phase of the task, participants are presented with a game (without instructions) in which the consonants of a CéCeC word are transfered into a CaCéCet template. Prompts include words witout χ as well as words with χ in C_2, such that participants are exposed trials that do not involve any alternation, as well as trials with an alternation in the (1) template but not in the (2) template (see examples in (3)). All pairs are introduced within the same carrier sentence.

[1] There are two exceptions to the lowering rule word-medially (*leħem* 'bread'*, reħem* 'womb'), but not word-finally, which is the environment that the current design targets.

3. Teaching phase trials:

look, he has a	**[páχan]**	on his face! oh, it seems like he has	**[paχénet]**
	[lérev]		[larévet]

In the test phase, participants are instructed to judge each trial on whether the experimenter is playing the game correctly or not, and if not, to provide an alternative if one comes to mind. The crucial trials include "ħ root" prompts with a CeC**a**χ noun, for which consistent targets involve lowering of both e's to CaCaχat and inconsistent targets do not involve lowering. "χ root" prompts included a CeCeC noun matched with opposite target CaCeχet/CaCaχat pairs. In order to control for prescriptive normativity, the test phase also included a control alternation between *p,b* and *f,p* respectively. These pairs rely on a diachronic rule (obscured in Modern Hebrew) originally applied in C_2 of CéCeC, but not in C_2 of CaCéCet. Prescriptive participants may prefer forms in which it applies; others may prefer no alternation (see (4)). Other trials included: (i) "error trials" in which a single consonant was changed, e.g., *keʃem–kalemet*; (ii) phonotactically illicit items in which vowels were gratuitously lowered without a following χ, e.g., *t**a**laχ, ʃev**a**l, ʃav**a**l**a**t*; and, as in the teaching phase, (iii) trials with χ in C_2 and (iv) trials without alternations.

4. Test phase target trial pairs. Each root was presented in one context per participant.

	/teleħ/	/teleχ/	/ʃebel/	/ʃebel/
prompt	telaχ	teleχ	ʃevel	ʃebel
consistent target	talaχat (compatible with lowering)	taleχet	ʃabelet (compatible with spirantization)	ʃabelet
inconsistent target	taleχet	talaχat	ʃavelet	ʃavelet

Predictions. The design distinguishes between three competing accounts, which assume different levels of linguistic knowledge: (i) purely phonotactic knowledge ("no **téla**v**-* and **tala**v**at-* type words"); (ii) Output-Output correspondence ("[a] in CéCeC → [a] in CaCéCet"); and (iii) differential status for "triggering χ" and "non-triggering χ", i.e., absolute neutralization ("if χ caused an alternation in CéCeχ, apply related alternations in CaCéχet"). An OO-correspondance account would not be straightforward if speakers are aware of the relationship between *both* the forms in (1) and the ones in (2): correspondence between templates cannot easily explain the difference between p**á**χ**a**n-paχénet and zér**a**χ–zar**á**χ**a**t, since *paχénet* is not faithful to ***a*** following χ, while *zaráχat* is. However, if speakers apply tél**a**χ–tal**á**χ**a**t and *overapply* p**á**χ**a**n-paχ**á**n**a**t, an OO-correspondence account would fit better than the others.

Possible contribution of orthography. In addition to phonological evidence to the distinction between /ħ/ and /χ/, there is also orthographic evidence, as they are represented by distinct letters – ח and כ respectively. Participants who are aware of the relationship between lowering and ח can perform the task through appealing to orthography. To test this possibility, participants performed a dictation after the main task, aimed to test whether they consistently write CéC**e**χ, CéχeC with כ, and CéC**a**χ, C**á**χ**a**C with ח.

The results of a pilot study (*N=6*) suggest a difference between speakers of the minority dialect (one who produces /ħ/ and one whose parents produce it) and majority dialect speakers (three other participants). One participant from the latter group rejected any alternation and was therefore uninterpretable. Other participants also favored faithful trials (i.e. no lowering, whether consistent or not), albeit to a lesser extent. Despite this limitation, the rate of acceptance of inconsistent trials was higher among majority dialect speakers. This was true for tél**a**χ–tal**é**χ**e**t as well as tél**e**χ–tal**á**χ**a**t trials. There was no correlation between the results of the dictation and those of the game, i.e., participants who rejected inconsistent trials were no more likely to spell CéC**a**χ with ח. Data collection is ongoing.

References. **Chomsky, N., & Halle, M.** (1968). The sound pattern of English. **Kiparsky, P.** (1968). How Abstract Is Phonology? Bloomington, Indiana: Indiana University Linguistics Club.