Levantine Arabic Epenthesis: Phonetics, Phonology, and Learning

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1. Introduction

•What is the connection between opacity, phonetic variation, and learning?

•**Levantine Arabic** stress-epenthesis opacity:

heavy penult stressed:

/ʔalif-na/ ʔa.líf.na 'our letter *alif*'

except when epenthetic V:

/ʔalf-na/ ʔá.lif.na 'our thousand'

(recently, McCarthy 2007, Kiparsky 2003)

•How is such a grammar learned?

•**Lebanese Arabic**: we show that epenthetic vowels are phonetically backer and/or shorter than lexical vowels. Extent of difference varies by speaker, as does the phonological context for epenthesis.

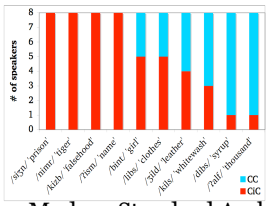
•We argue that learners use this phonetic variation as a crutch for learning the correct underlying representations.

•Some speakers of **Palestinian Arabic** can optionally stress epenthetic vowels.

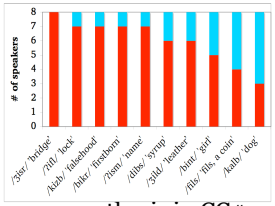
•Do Palestinians distinguish these vowels phonetically?

2. Phonological variation

Palestinian epenthesis



Lebanese epenthesis



•Modern Standard Arabic : no epenthesis in CC#.

•Epenthesis in Levantine CC#:

- •Rising sonority (dm, kl): almost obligatory
- •Flat/falling sonority (fs, nt): optional, variable

•Likelihood of epenthesis determined by:

- •*Sonority profile*: rising > falling
- •*Voicing*: voiced > voiceless
- •*Place* constraints
- •*Manner*: sibilants, stops ok finally

(Haddad 1984, Farwaneh 1995)

3. Phonetic study: design

Participants:

• 8 Lebanese speakers (from various locations in Lebanon, recorded in the US and UK)

• 8 Palestinian speakers (recorded in Haifa, Israel)

•3 men, 5 women in each group

•All are at least bidialectal in Standard Modern Arabic, as is normal in the Arab world.

Materials: 30 minimal and near-minimal pairs, pseudo-randomized and embedded in a list of 50+ fillers. First vowel was always high.

/CVCC/	non-verbs	/CVCVC/	verbs
bikr	'first-born'	sikir	'got drunk'
rikb	'riding'	rikib	'rode'
nimr	'tiger'	ximir	'rose'
libs	'clothes'	libis	'wore'

•Presented in consonantal Arabic script w/ English translations.

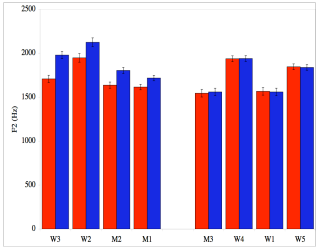
•To disambiguate minimal pairs, words were grouped in verb/non-verb blocks.

•**Analysis**: Spectrographic; measured duration, F1, F2, F3, and intensity.

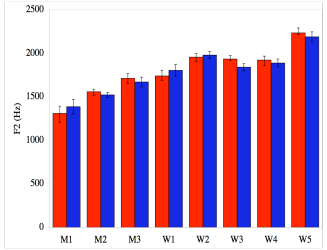
4. Phonetic study: results

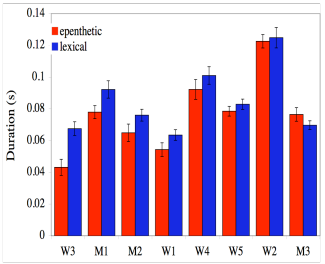
Lebanese duration: epenthetic < lexical, ep. F2 < lexical F2.
F1 approached signif. for some speakers; Everything else n. s.
Palestinian duration: same trends but n.s.; F1, F2 and F3 n.s.

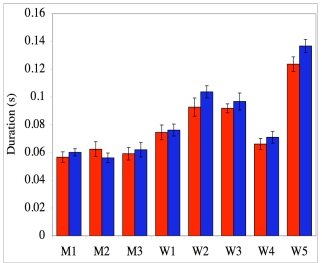
Lebanese by speaker



Palestinian by speaker







5. A theory of incomplete neutralization

•Incomplete neutralization is phonetics accessing a representation which is intermediate between input and output.

•**Optimality Theory with Candidate Chains** (McCarthy 2007):

- •A candidate is a chain, e.g. /pada/ <pa.da, pad, pat> [pat]
- •*Gradualness*: one change (basic faith violation) at a time
- •*Harmonic improvement* required at each step
- •Sonorous epenthetic vowels = harmonic improvement but also greater unfaithfulness (Gouskova 2003, Howe and Pulleyblank 2004).

Dep-a>>Dep-e,o>>Dep-i,u>>Dep-ə>>Dep-ɨ

Epenthetic candidate with [i] in OT-CC under gradualness:

/bikr/ <bikr, bikɨr, bikər, bikir>

Proposal for incomplete neutralization: phonetics can optionally access any part of the chain.

phonological representation

/bikr/ <bikr, bikɨr, bikər, bikir>

phonetic realization

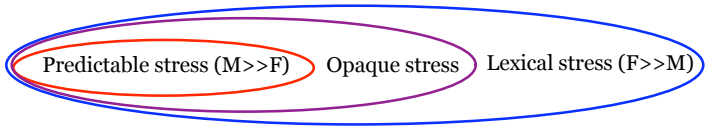
Phonetics interpolates continua between steps in a chain.

•The faithful candidate is part of the chain, so sometimes there is no epenthesis.

•**Prediction**: some speakers should have [ə], not [ɨ]. True for some Lebanese speakers, whose epenthetic vowels were significantly lower than lexical ones.

5. Learning

•*Subset problem:* The learner must find the grammar that produces stress-epenthesis interactions but cannot assign stress freely, as in a lexical stress pattern.



•Alderete and Tesar (2002): Before positing underlying stress distinctions, learners must consider unfaithful origin of vowel as the explanation for opaque stress. This assumes that learners cannot distinguish surface epenthetic and lexical vowels.

•**Our proposal:** Learners posit a candidate chain based on surface phonetic variants. Each surface variant corresponds to step in chain. Phonetic variation requires longer chains.

•Positing correct derivations is easier for Lebanese speakers than for Palestinians, who don't make drastic quality differences between epenthetic and lexical vowels.

•Over time, opaque stress is reanalyzed as predictable stress (cf. Labov, Karen and Miller 1991 and others).

Thanks to Ron Artstein (U of Essex) for help with this study