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Acceptability of Variation in Modern Hebrew Spirantization

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Modern Hebrew Spirantization

Regular Alternation

In Modern Hebrew, the stops [p], [b], and [k] and the fricatives [f], [v], and [χ] occur in allophonic distribution. The fricatives surface post-vocalically and the stops surface elsewhere.

(1) Spirantization Distribution in Modern Hebrew

	root	3p.sg.past	infinitive	
[p], [f]	/prs/	[paras]	[lifros]	'to spread'
[b], [v]	/bnh/	[ban]	[livnot]	'to build'
[k], [χ]	/ktb/	[katav]	[liχtov]	'to write'

Exceptionality

Due to historical mergers, degemination, and recent borrowings, there are many exceptions to spirantization with cases of [b], [p], and [k] occurring post-vocalically and [v], [f], and [χ] occurring non-post-vocalically.

(2) Exceptions to Modern Hebrew Spirantization

Post-vocalic stops		Word-initial fricatives	
[likro]	'to read'	[faʃla]	'mistake'
[lesaper]	'to tell'	[viter]	'conceded'
[leχabel]	'to sabotage'	[χalam]	'dreamt'

In Modern Hebrew, a given word can contain both exceptional and regularly alternating segments. Exceptionality, then, must be encoded at the segmental level, rather than the word level.

(3) Hybrids in Modern Hebrew Spirantization

[likbor]	'to bury'	[kavar]	'buried'
[likpo]	'to freeze'	[kafa]	'froze'

Variation

Variation in spirantization occurs in colloquial speech (Adam 2002):
- Stops and fricatives occurring in contexts not predicted in (1).
- Unlike exceptions in (2), these segments normally *do* conform to the distribution in (1).

(4) Variation in Modern Hebrew Spirantization

Expected	Acceptable Variant	Gloss
[pizer]	~ [fizer]	'scattered'
[jikbor]	~ [jikvor]	'will bury'

To examine the nature of the variation reported in Adam (2002) and in a pilot study in Temkin Martínez (2008), an acceptability rating task was designed.

LSA 2009
Phonology - Session 41
Saturday, 10 January
2:00PM - 3:30PM

Acceptability Rating Task

Predictions

I. Variation is acceptable in cases of regular alternation. Based on Adam (2002) and on the pilot study in Temkin Martínez (2008), we predict that *variant* forms will be deemed acceptable by some participants, but will receive a lower rating than their *expected* counterparts.

II. In exceptional cases, variation is less acceptable. Given the absence of data on variation in exceptional segments, and preliminary testing with native speakers in which variation was deemed unacceptable for exceptional segments, we predict that variation in exceptional cases will be deemed less acceptable than in cases of regular alternation.

I. Segments' positions will play a role in the acceptability of variation. Within regularly alternating segments, Adam (2002) predicts that only the velars will vary post-vocalically. All segments are predicted to vary word-initially and post-consonantally. The pilot results from Temkin Martínez (2008) show that variation is at least somewhat acceptable in all positions, and is most acceptable in post-vocalic position.

Methods

204 stimulus sentences were recorded as spoken by a 33-year old male native speaker, with regular and exceptional segments occurring in word-initial, post-vocalic, and post-consonantal positions. Half of the sentences were recorded with the **expected** form of the verb, and the other half with the **variant** form.

The study was done entirely in Hebrew and online, using a .php script written by Ed Holsinger. 74 native Hebrew speakers (ages 19 - 40) were asked to listen to and rate the naturalness of the pronunciation of verbs with expected or variant forms of the segment in question. To limit the duration of the experiment, each participant was presented auditorily with half the sentences (split across conditions).

(5) Sample Carrier Sentence for Target Words
[amru li ʃedaniel ___(target verb)___ le/be/me _____]
Told to me that Daniel (target verb) to/in/from _____
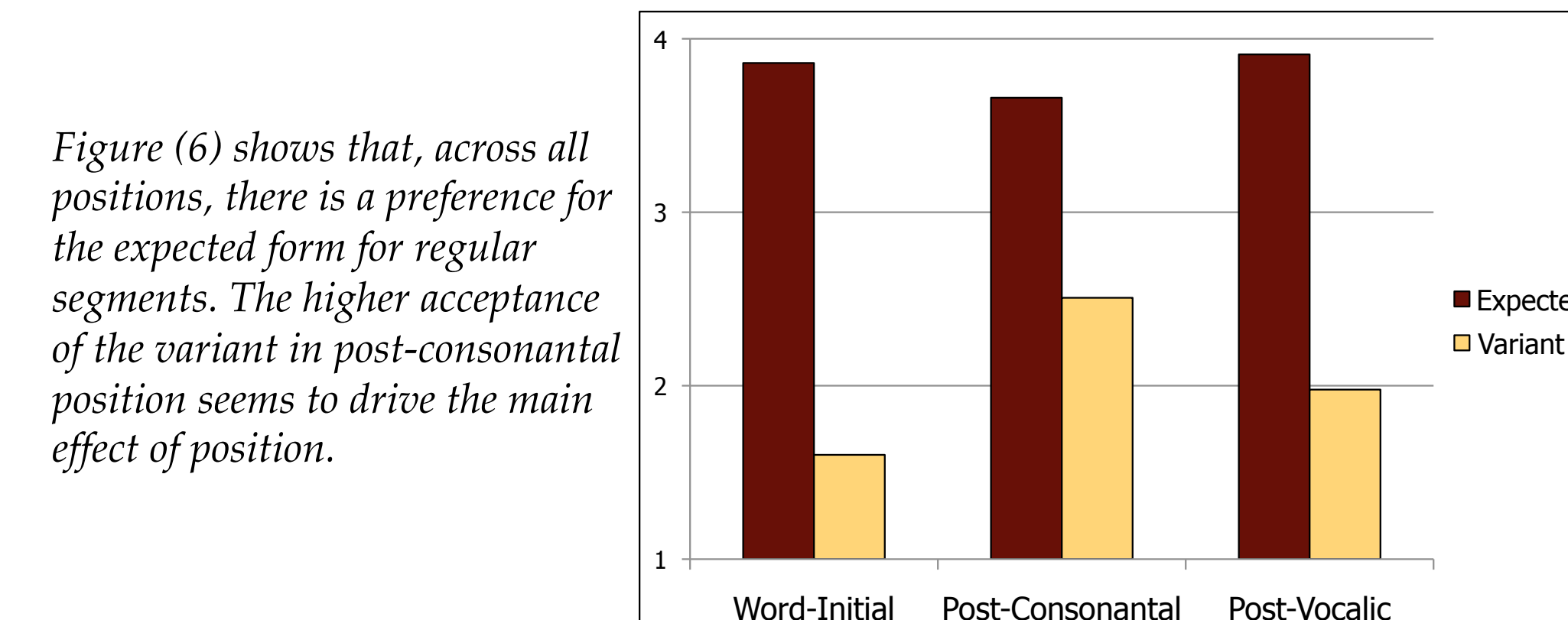"I've been told that Daniel (target verb) to/in/from _____"

Results

The results of a repeated-measures ANOVA for type (regularly alternating vs. exceptional) and allophone (variant vs. expected form) reveal a significant main effect of allophone ($F_{(1,73)} = 820.043$, $p < .001$), showing that, as hypothesized, tokens with the target segment in the *expected* form were rated more natural than tokens with the target segment in the *variant* form. This is true overall and across all segment positions.
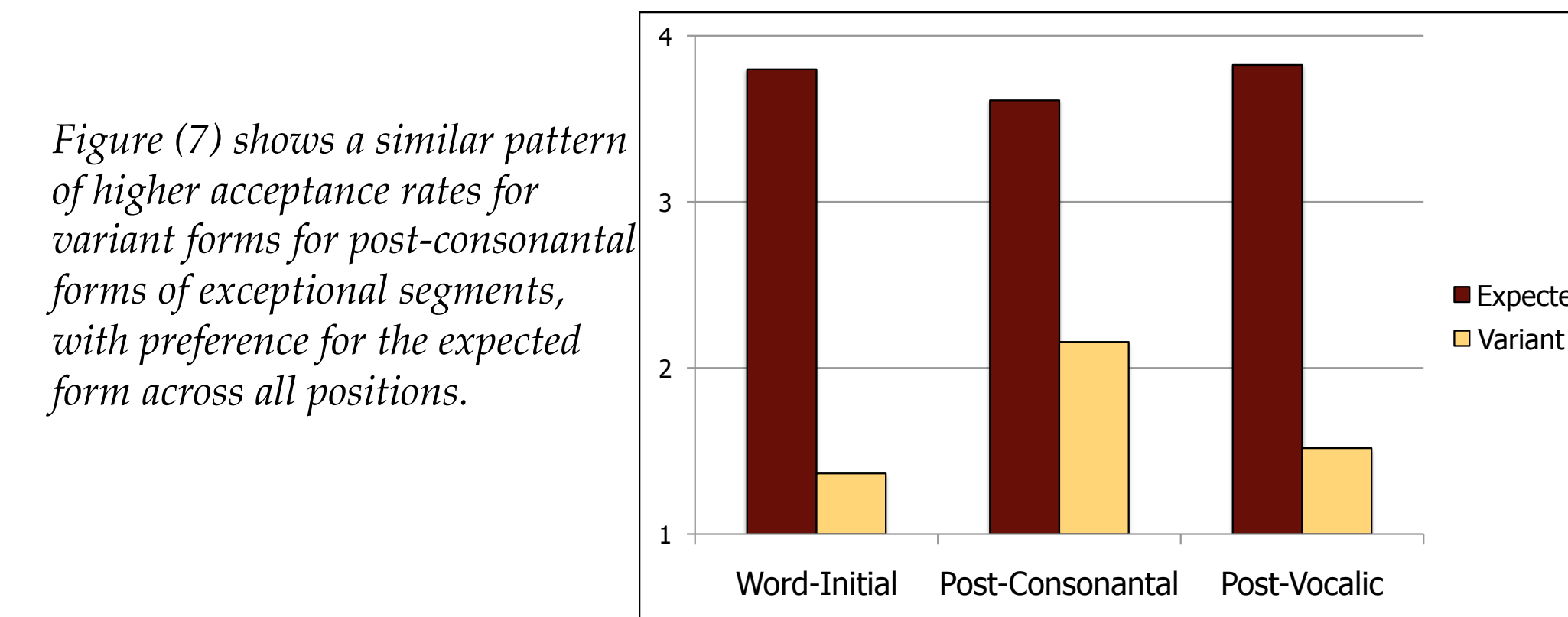
The results of a repeated-measures ANOVA for position and allophone also show a significant main effect of position ($F_{(2, 71)} = 63.588$, $p < .001$) and a significant interaction of position and allophone ($F_{(2, 71)} = 153.817$, $p < .001$).

Results

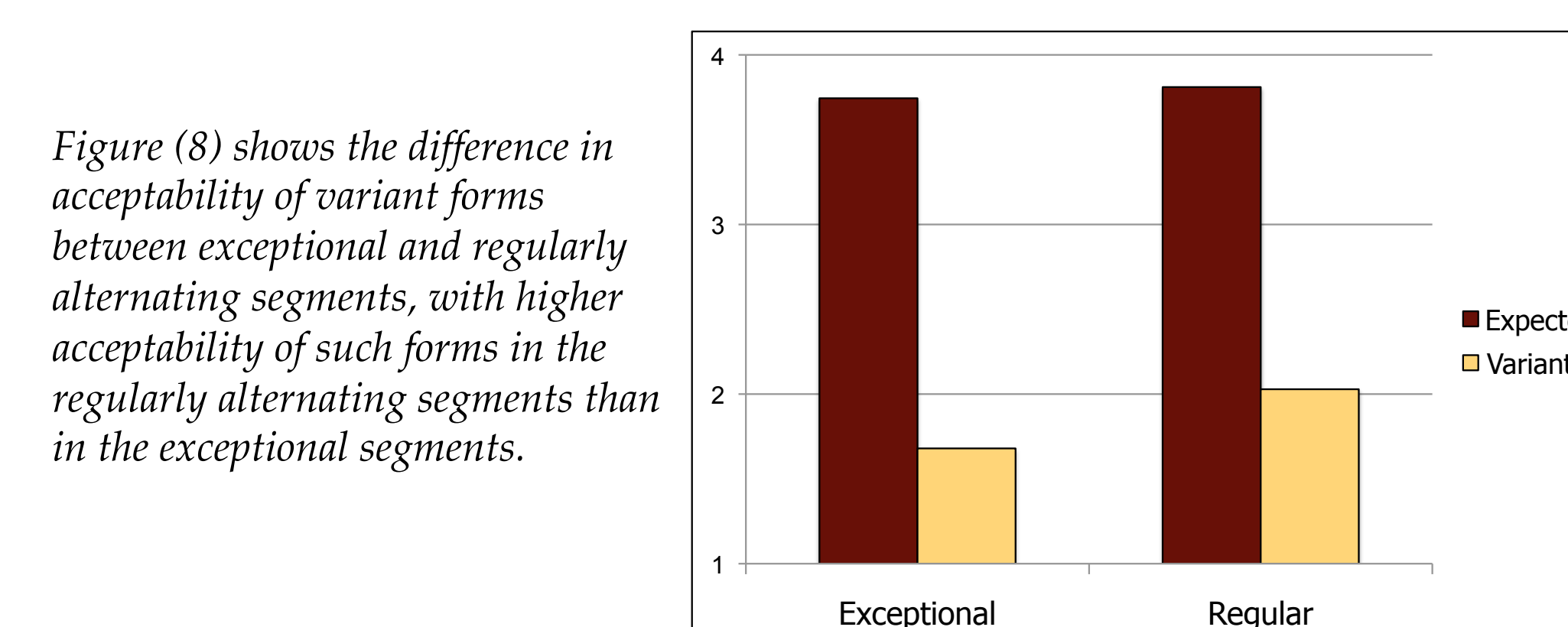**(6) Acceptable Variation in Regularly Alternating Segments**

Figure (6) shows that, across all positions, there is a preference for the expected form for regular segments. The higher acceptance of the variant in post-consonantal position seems to drive the main effect of position.

(7) Acceptable Variation in Exceptional Segments

Figure (7) shows a similar pattern of higher acceptance rates for variant forms for post-consonantal forms of exceptional segments, with preference for the expected form across all positions.

There was also a significant interaction between type and allophone ($F_{(1, 73)} = 17.481$, $p < .001$), driven by the fact that, as hypothesized, variation in exceptional segments was rated less natural than variation in regularly alternating segments.

(8) Regularly Alternating vs. Exceptional Segments

Figure (8) shows the difference in acceptability of variant forms between exceptional and regularly alternating segments, with higher acceptability of such forms in the regularly alternating segments than in the exceptional segments.

The results indicate that while variation in exceptional segments is somewhat acceptable, it is significantly less so than variation in regularly alternating segments.

Analysis: Regular Alternation

The following constraints and ranking will be used to account for the allophonic distribution in (1):

(9) Constraints for Modern Hebrew Spirantization

*V-STOP	Post-vocalic stops are prohibited.
*[+cont, -sib] (*STOP	Non-sibilant fricatives are prohibited. Stops are prohibited.**)**
IDENT-IO[cont]	Input-output correspondents are identical in [±cont].

*V-STOP » ***[+cont, -sib]** » **IDENT-IO[cont]** (***STOP**)

(10) Tableau for Regular Alternation

A. /kpr/ + (inf) *'to deny'*	**V-STOP*	**[+cont, -sib]*	IDENT-IO[cont]
☞ a. liχpor		*	*
b. likpor	*!		

Analysis: Exceptions and Variation

Exceptionality

Exceptional segments and regularly alternating segments are members of distinct sets. To account for this, we propose expanding the set-based approach (Pater 2000) to the segmental level.

Under this approach, exceptional segments are indexed to a set with a corresponding faithfulness constraint for continuity which dominates the relevant markedness constraints. This way, the segments do not alternate.
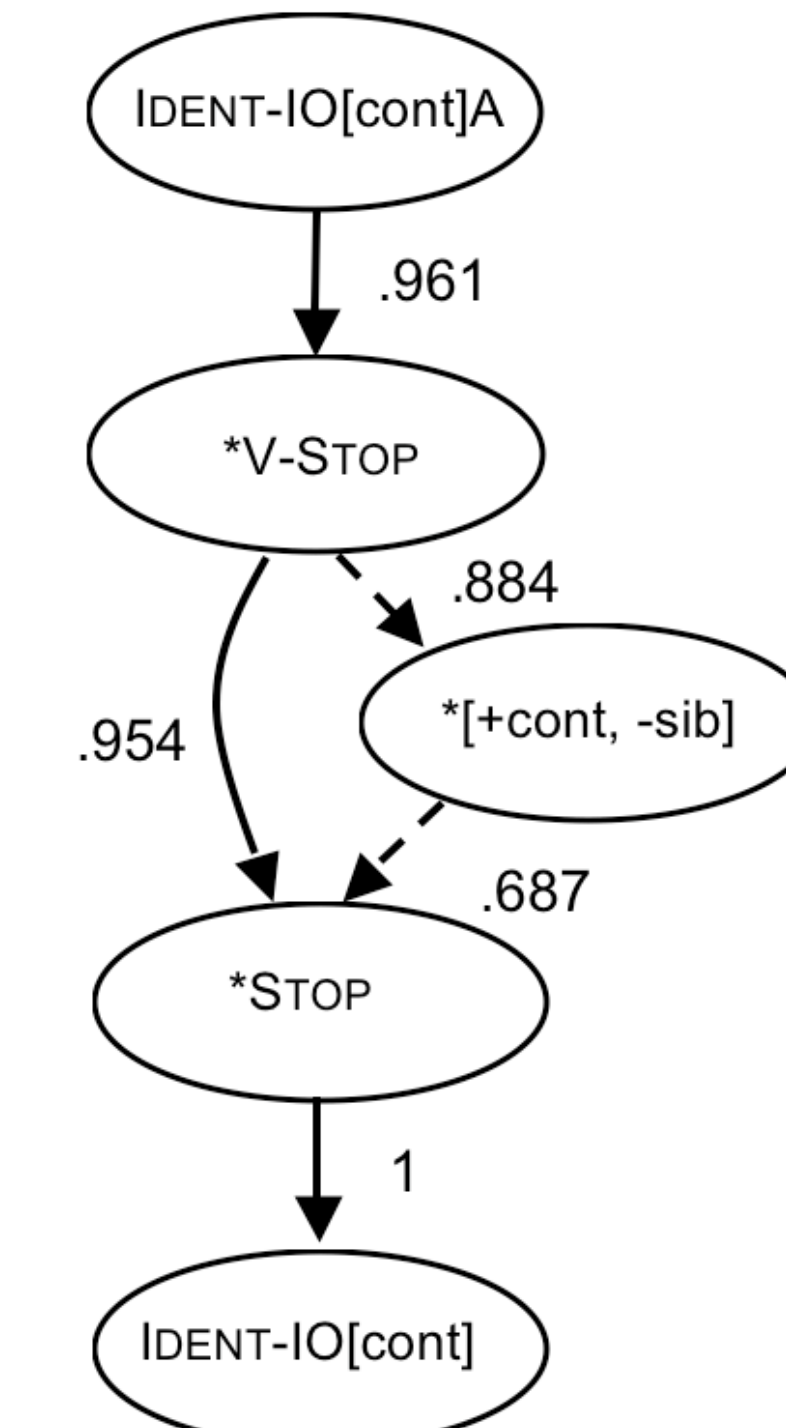
Variation

Variation will be resolved by using stochastic ranking of the relevant constraints (Boersma 1998, Hayes & MacEachern 1998, Zuraw 2000). The model, based on the Gradual Learning Algorithm, assumes that grammar outputs are affected by lexical variant frequency. The generated frequencies, though driven by the frequencies in the input (in this case, iterations of acceptability ratings from the rating task), are not a mirror copy of them.

The Combined Model

Using the set based approach to account for exceptionality and Stochastic OT to account for the variation, the combined model allows for higher rates of variation in regular segments than for exceptional segments.

New information regarding the interaction of position and allophone must be taken into account for the final model.

(11) Variation Using the Combined Model
A. [likbor] *(expected, 68.4%)* ~ B. [likvor] *(variant, 31.6%)*
Stochastic ranking of *[+cont, -sib] and *STOP

A. /k$_\Lambda$br/ + inf. *'to bury'*	IDENT-IO[cont]$_A$	*V-STOP	*[+cont, -sib]	*STOP	IDENT-IO[cont]
a. lik$_\Lambda$vor		*	*!	*	*
☞ b. lik$_\Lambda$bor		*		**	
c. liχ$_\Lambda$vor	*!		**		**
d. liχ$_\Lambda$bor	*!		*	*	*

B. /k$_\Lambda$br/ + inf. *'to bury'*	IDENT-IO[cont]$_A$	*V-STOP	*STOP	*[+cont, -sib]	IDENT-IO[cont]
☞ a. lik$_\Lambda$vor		*	*		*
b. lik$_\Lambda$bor		*	**!		
c. liχ$_\Lambda$vor	*!			**	**
d. liχ$_\Lambda$bor	*!		*	*	*

Conclusion

An online rating task reveals acceptability of variation in regularly alternating segments is significantly higher than it is in exceptional segments. We present an Optimality Theoretic account combining an expansion of Pater's (2000) set-based approach to the segmental level to allow for the distinction between the two types of segments, and stochastic rankings of the relevant constraints (based on acceptability in the rating task) to allow for variation.