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 [x] occur in allophonic distribution. The fricatives surface post-vocically and the stops surface elsewhere.

(1) Spirantization Distribution in Modern Hebrew

\[ \begin{array}{l|l}
\text{post-vocally} & \text{post-consonantally} \\
\hline
[p] & [b] \\
[f] & [v] \\
[x] & [x] \\
\end{array} \]

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

(2) Exceptions to Modern Hebrew Spirantization

\[ \begin{array}{l|l}
\text{post-vocally} & \text{post-consonantally} \\
\hline
[bb] & [b] \\
[kk] & [k] \\
[bb] & [b] \\
[kk] & [k] \\
\end{array} \]

Variation
Variation in spirantization occurs in colloquial speech (Adarn 2002) and in a pilot study in Temkin Martinez (2008), an acceptability rating task was designed.

Acceptability Rating Task

Predictions
I. Variation is acceptable in cases of regular alternation. Based on Adam (2002) and on the pilot study in Temkin Martinez (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.

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 Holinger. 74 native Hebrew speakers (ages 18 – 45) 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 auditorially with half the sentences (split across conditions).

(5) Sample Carrier Sentence for Target Words

\[ \text{I've been told that Daniel [expected verb] to me / to [variant verb].} \]

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) = 72.60, 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) = 43.086, p < .001) and a significant interaction of position and allophone (F (2, 71) = 133.417, p < .001).

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

- [cont, +sib]

- [cont, -sib]

*IDENT-O[cont]

- [cont]

*V-STOP = [cont, +sib] \& IDENT-O[cont] \& *STOP

(10) Tableau for Regular Alternation

<table>
<thead>
<tr>
<th>Position</th>
<th>[cont, +sib]</th>
<th>[cont, -sib]</th>
<th>[cont]</th>
<th>[cont, +sib] &amp; IDENT-O[cont] &amp; *STOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-vocally</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Post-consonantally</td>
<td>1</td>
<td>1</td>
<td>1</td>
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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 reasoning for the distinction between the two types of segments, and stochastic rankings of the relevant constraints based on acceptability in the rating task.

Variation

Variation will be resolved by using stochastic ranking of the relevant markedness constraints (Boersma 1998, Hayes & MacEachern 1997, Zurave 2003). 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 rate 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. [lik] (expected) 64.9% - B. [lik] (variant) 31.6%

Stochastic ranking of *V-STOP and *STOP

Final model:

\[ \begin{array}{l}
\text{Post-vocalic segments are stepped.} \\
\text{Post-consonant segments are not stepped.} \\
\text{The rates of variation in exceptional segments are rated lower than for anchors.} \\
\end{array} \]

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

- [cont, +sib]

- [cont, -sib]

*IDENT-O[cont]

- [cont]

*V-STOP = [cont, +sib] \& IDENT-O[cont] \& *STOP

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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.

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