Trill Variation in Dominican Spanish: An Acoustic Examination and Comparative Analysis

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1. Introduction

Within the Dominican Republic there are dialectal variations of the Spanish rhotic. Previous research concerning dialectal variation of Dominican Spanish rhotics has focused primarily on coda resolution: vocalization (see 1a) in the Cibao, and lateralization in the capital Santo Domingo (see 1b).

(1) (a) Vocalization of liquids primarily located in the greater Cibao region.

<table>
<thead>
<tr>
<th>Spanish</th>
<th>Dominican Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>verdad</td>
<td>[bej,oa] 'truth'</td>
</tr>
<tr>
<td>comprar</td>
<td>[kom.praj] 'to buy'</td>
</tr>
<tr>
<td>algo</td>
<td>[ai,ro] 'something'</td>
</tr>
</tbody>
</table>

(b) Lateralization of rhotics located throughout Santo Domingo

<table>
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<tr>
<td>verdad</td>
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</tr>
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These defining dialectal characteristics, however, are typically more prevalent among the lower socioeconomic levels (Jiménez Sabater 1975). The variation in more normative dialectal forms spoken by educated speakers is less dramatic and reflects variable preferences of a particular token form in terms of degree or frequency. For example, Alba (1990, 2000) notes a variable preference motivated by sociolinguistic variables for the segments /s/, and /l/ and /r/ in coda position in Santiago (Cibao dialect) as well the production of coda /s/ in Santo Domingo.

Variation in the production of the phonemic trill has long served as a defining feature of dialectal variation in characterizations of Spanish variation (Bradley 1999, Colantoni 2001, Lipski 1994, Moreno 1988, Resnick 1975, Zamora and Guitart 1988). There are a number of distinct dialectal realizations of the Spanish phonemic trill which include: a trill, an assibilated trill, a uvular trill, and a “pre-aspirated” trill. The few reports on the trill in Dominican Spanish have tended to report the overall variation present in Dominican Spanish or focus on specific theoretical claims (Alba 1990, Jiménez Sabater 1975, Núñez-Cedeño 1989, 1994). The reality of rhotic variation in coda position along with other innovative characteristics raises the possibility of trill variation within the Dominican Republic. The objective of the current paper is to provide an examination of trill variation of urban middle class speakers based on acoustic measurements for two principal dialects of Dominican Spanish, namely, Cibaeño and Santo Domingo.

The organization of the remainder of the paper is as follows: Section 2 reviews variation of the trill in Dominican Spanish. Section 3 details the methodology for the study. Section 4 contains the findings on the acoustic examination of the Santo Domingo Dominican Spanish trill. Section 5 discusses the acoustic characterization of the SDDS trill and compares the current SDDS findings with respect to Willis (2005) and previous studies of Dominican Spanish trills. The conclusions of the study are presented in Section 6.*

* Recording facilities and access to students at the Pontificia Universidat Católica Madre y Maestra, Recinto Santo Tomás de Aquino were generously provided by Elisa Núñez, Licenciada. The paper has benefited from comments from José Ignacio Hualde, John Lipski, Erin O’Rourke and two anonymous reviewers. All mistakes remain my own. The travel to collect the data was funded by a mini-grant from the College of Arts and Sciences, New Mexico State University.

2. Literature Review

Characterizations of Dominican Spanish have noted a pre-aspirated trill (Lipski 1994); however, these characterizations are based on several conflicting earlier accounts. Henríquez Ureña (1940) claims that there are no velar varieties nor are there trills with fricativization or assimilation in Dominican Spanish (139). Navarro Tomás (1956) reports that the Dominican Spanish /r/ is never clearly multiple, as seen in Castile, but rather, it is realized as an apicoalveolar fricative or an assimilated variant. Jiménez Sabater (1975), the most thorough study to date regarding variation of the trill in Dominican Spanish, claims that the variant that was more or less generalized throughout the Dominican Republic is the multiple vibrato [r] (86) with variable productions of a voiceless fricative that at times is assimilated (87). He later modifies his claim to suggest that the [h-r] allophone is most frequent among speakers of the middle urban class. While Núñez-Cedeño (1994) claims the “pre-aspirated” trill only occurs in word medial position, there is no overt claim of dialectal variation. In these accounts, pre-aspiration can be understood as a fricative element preceding the actual trill; however, no acoustic specifics are provided.

Willis (2005) is an acoustic study of 214 trills by 10 educated speakers of Cibaeño Dominican Spanish (hereafter CDS). He claims that the CDS “pre-aspirated trill” is a misnomer and the CDS trill is best characterized as a period of “pre-breathy voice” followed by one or two taps. The pre-breathy voiced portion typically constituted more than 60% of the overall duration of the segment. The most frequently occurring token in the data is a “pre-breathy voice tap” and accounted for 56% of the corpus tokens (see Figure 1). These two voiced allophones, ([fᵢr] and [fᵢr]), account for approximately 75% of the productions. The average number of closures in these trill tokens was 1.2 across all phonemic trill productions. Willis proposes [fᵢ] as an IPA symbol to represent the CDS trill. The second most frequently occurring token type involves a period of pre-breathy voice followed by multiple closures and accounts for 17% of the token types. Tokens with multiple closures account for only 46 tokens or 21% of the CDS trills.

Figure 1: Cibao Dominican Spanish pre-breathy voiced trill from Willis (2005).

1 The actual claim was that there was no rehilamiento which can be understood as a reduction to a fricitive or assimilated variant. For example, the term is used commonly to denote the palatal approximant in Argentine Spanish that is produced as an alveo-palatal fricative, /j/ → [fᵢ].

2 For an overview of pre-aspiration, see Ladefoged and Maddieson (1996) and Silverman (2003).
This brief review of the literature reveals the paucity of information concerning dialectal variation of the trill in Dominican Spanish. This paper seeks to address what the acoustic characteristics of the trill in Santo Domingo Spanish are, and whether there is variation in the trill in the two principal dialects of Dominican Spanish. These questions are examined through an acoustic analysis of the Santo Domingo Dominican Spanish trill in a controlled elicitation study to provide an acoustic analysis of the SDDS trill and to determine the extent of dialectal variation in Dominican Spanish by comparing trills in the two principal dialects: Santo Domingo and the Cibao (Willis 2005).

3. Method
3.1. Speakers

Students from the Pontificia Universidad Católica Madre y Maestra, Recinto Santo Tomás de Aquino in Santo Domingo served as informants for the current study and were recorded in March of 2004. The students were all native to Santo Domingo, Dominican Republic, and furthermore, the speakers were recorded in the dialect location to eliminate potential interference due to contact. All informants were second generation university students to provide a minimal control of their socio-economic status. This dialect will be referred to hereafter as educated Santo Domingo Dominican Spanish, (SDDS).

3.2. Data elicitation

Each speaker was engaged in an informal interview about him or herself to solicit natural conversation prior to performing several linguistic tasks. Topics of the informal conversation included family life, school, a scary experience, or a happy memory from their childhood. One of the linguistic tasks was to narrate the children’s picture book by Mercer Mayer, *Frog, Where Are You?* (1969). The speech from the narrative of this story serves as the basis for the current study. The story is about a little boy, a *perro* ‘dog’, and a *rana* ‘frog’, which induced multiple productions of the trill segment. The trill was often produced both within the tonic syllable as well as atonically due to the speaker’s spontaneous addition of a diminutve morpheme –ito/a as in *perro* ‘dog’ ~ *perrito* ‘dog-diminutive’ or *rana* ‘frog’ ~ *ranita* ‘frog-diminutive’. Each speaker typically produced between 15-45 tokens of the trill. The current data consists of 256 trills, 92 by male speakers and 164 trills by female speakers.\(^3\)

3.3. Equipment and acoustic measurements

A private office within the Department of Languages and Literatures of the Pontificia Universidad Católica Madre y Maestra Recinto Santo Tomás de Aquino was used for recording the informants. The speech was recorded directly onto a laptop computer using CoolEdit and a USBpre external sound card and a Shure 512 microphone and was sampled at 44.1k. The trills were extracted from the recording and analyzed with PRAAT, an acoustic software analysis program. The data analysis considers the sex of the speaker and word position of the trill, initial versus medial, as variables. Vowel quality was not examined as there was not a representative distribution of vowel tokens to permit a comparison, nor was the role of stress examined.\(^4\) The acoustic measurements of the SDDS trill in the current study include the duration of the ‘trill’ segment, the duration of the pre-breathy voice, and the number of occlusions. The principal cues used to determine the boundary of pre-breathy voice were a burst in the wave form and a sharp reduction in the amplitude of the wave form.\(^5\) In the current study pre-aspiration or pre-breathy voice refers to the segmental portion preceding the first closure or tap of the segment.

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\(^3\) The durations of the narrative were not as disproportionate as the frequency of trill production would suggest. The variation in token production frequency is likely due to a preference for anaphoric repetition.

\(^4\) Blecua (2001) and Willis (2005) find no significant relationship between stress and trilling in Peninsular and Cibaeño Dominican Spanish, respectively.

\(^5\) Helgason (2003) proposes the following cues to identify the onset of pre-aspiration: 1) a brief burst in the spectrogram, 2) cessation of or reduction of formant structure, 3) a sharp reduction in the amplitude of the wave form, and 4) frication present in the spectrogram.
4. Findings

4.1. Acoustic findings

The Santo Domingo trill data revealed many of the same trill types described in the Cibao dialect (see section 2.2). However, the present corpus also manifested two allophones not reported for CDS. The SDDS variations involved variations in voicing and place of articulation. The types and distribution of the tokens of the Santo Domingo trill allophones are presented in Table 1.

<table>
<thead>
<tr>
<th>IPA</th>
<th>Num.</th>
<th>%</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ɦ]</td>
<td>23*</td>
<td>9%</td>
<td>Voiced glottal fricative</td>
</tr>
<tr>
<td>[ʃ]</td>
<td>26</td>
<td>10%</td>
<td>Voiceless alveo-palatal fricative</td>
</tr>
<tr>
<td>[ɦɾ]</td>
<td>78*</td>
<td>30%</td>
<td>Pre-breathy voice followed by a single tap</td>
</tr>
<tr>
<td>[ɦr]</td>
<td>53*</td>
<td>21%</td>
<td>Pre-breathy voice followed by multiple closures (trill)</td>
</tr>
<tr>
<td>[ɾ]</td>
<td>25</td>
<td>9%</td>
<td>Single tap</td>
</tr>
<tr>
<td>[r]</td>
<td>40</td>
<td>16%</td>
<td>Multiple closures without preceding breathy voice (trill)</td>
</tr>
<tr>
<td>misc.</td>
<td>11</td>
<td>4%</td>
<td>Post-tap frication (typically)</td>
</tr>
</tbody>
</table>

Table 1: Acoustic variations and frequency of occurrence of the SDDS phonemic trill. The tokens marked with an asterisk each had a few productions that were produced as a voiceless variant.

For the most part the segment types correspond with the findings of Willis (2005). The unique SDDS allophones include a voiceless alveopalatal fricative and the miscellaneous category. The additional category of miscellaneous productions contains those productions that do not fit either standard characterizations of pre-breathy voice or a trill and typically involved a tap with following frication or aspiration. Figure 2 is an example of a SDDS voiced glottal fricative.

![Figure 2: SDDS Voiced glottal fricative in the utterance la ranita ‘the little frog’](image-url)
In Figure 2 there is a periodic waveform with evidence of some formant structure in the spectrogram. Also the spectrogram in Figure 2 reveals a continuation of the voicing bar throughout the segment. The trill type described as an alveopalatal fricative, illustrated in Figure 3, has an aperiodic wave form, a complete cessation of the voicing bar, and a concentration of energy beginning in the 3200 Hz range and continuing upward (see Ladefoged 2003).

![Figure 3: SDDS voiceless alveopalatal fricative in the utterance *perro* ‘dog’.](image)

As noted in Table 1, the most frequently occurring segment type in the SDDS corpus was the pre-breathy voiced tap [ɦɾ] shown in Figure 4 accounting for roughly 30% of the tokens. However, as will be discussed, there was variability in the duration of the pre-breathy voice segment and overall segment duration. The duration of pre-breathy voice of the allophone [ɦɾ] in Figure 4 was 31 ms with total trill duration of 46 ms.

![Figure 4: SDDS pre-breathy voiced tap in the utterance *la ranita* ‘the frog-diminutive’.](image)
The pre-breathy voice trill [fir] constituted 21% of the total trill tokens. An example of the pre-breathy voiced trill is presented in Figure 5. In several cases there were three taps following the pre-breathy voiced portion of the segment.

Due to space limitations, examples of the standard Spanish multiple tapped trill and single tap types are not provided. An example of the miscellaneous category, primarily comprised of productions with an initial tap followed by fricativization or aspiration, is presented in Figure 6.

Figure 7 is a final example of the SDDS and illustrates a trill in initial position following a brief pause. In this example the trill segment is produced with initial voicelessness followed by a svarabhakti or epenthetic vowel (inherent in trills) and then a tap.

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6 See Willis (2005) for examples of CDS trills produced as a standard trill and as a tap. See also Quilis (1993) or Hualde (2005) for spectrogram examples of both the trill and tap.
Table 2 presents the SDDS acoustic characteristics of pre-breathy voice duration, total segment duration, number of closures, and percentage of pre-breathy voice with respect to the overall segment for all the trill tokens produced. The trill productions are divided by position within the word, word-initial versus word-medial.

<table>
<thead>
<tr>
<th>Spkrs</th>
<th>Word initial trill</th>
<th>Word medial trill</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Num.</td>
<td>PBV</td>
</tr>
<tr>
<td>Fem.</td>
<td>97</td>
<td>36 ms</td>
</tr>
<tr>
<td>Male</td>
<td>36</td>
<td>70 ms</td>
</tr>
<tr>
<td>Ave.</td>
<td>47 ms</td>
<td>85 ms</td>
</tr>
<tr>
<td>S.D.</td>
<td>26</td>
<td>37</td>
</tr>
</tbody>
</table>

Table 2: Acoustic characterization of the SDDS trill tokens. Values are conflated means for all trill types. PBV refers to pre-breathy voice.

Males tended to have a longer pre-breathy voice duration and overall segment duration that was more pronounced in word initial position. In terms of percentages, the male speakers had a higher duration of pre-breathy voice compared to overall segment duration than the female informants. The mean duration percentage of pre-breathy voice for both genders in both word initial and word medial position constituted the majority of the segment.

4.2. Distribution of SDDS trill types

A frequency distribution of trill allophones by gender is misleading due to the degree of idiosyncratic variation within the speakers that is illustrated in Table 3. For example, the production of the alveopalatal token [ʃ], comprising 10% of all tokens, was in fact overwhelmingly produced by one female speaker, NH. Another trill type, the pre-breathy voiced trill [ɦᵊ], was skewed by Speaker ME. The majority of the standard Spanish trill productions were again produced by a reduced number of speakers. The number of tokens in the miscellaneous category was also affected by a single speaker.
Table 3: Frequency of SDDS trill allophones by individual speakers.

The two most frequently occurring trill types in both dialects, [ɦɾ] and [ɦɾ], were generally found in the speech of the majority of the SDDS speakers. Both pre-breathy voiced trill types occurred in nine out of ten speakers. The apicoalveolar fricative [ʃ], the multiple tapped trill [r], and the miscellaneous category illustrated in Figure 6 were the least representative and distributed trill allophones across the speakers.

4.3. Dialectal comparisons
4.3.1. Trill type distributions

For both dialects, the central tendency is to produce the trill as a pre-breathy voiced variant. The variation in token frequencies between the two dialects may in large part be due to the idiosyncratic variation discussed in Section 4.2 and shown in Table 4. In the current data set the SDDS dialect presents more variation than the CDS dialect; however, it is not sensible to draw definitive conclusions from such a small sample size.

Table 4: Types and distribution frequency as a percentage for SDDS and CDS trills. *Data from Willis (2005).

4.3.2. Acoustic comparisons of SDDS and CDS trills

Combing gender, the acoustic characterizations for both dialects of Dominican Spanish are presented in Table 5. There are two differences between the dialects. The SDDS dialect tended to have a higher average number of occlusions in the production of the trill tokens; however, this finding likely has more to do with the additional trilled tokens in the SDDS corpus (see Table 5) combined with the idiosyncratic preference for Speaker ME to produce a large number of [ɦɾ] tokens (see Table 3).
Table 5: Dialectal comparisons of the conflated acoustic measures form SDDS and CDS trills by word position. PBV refers to pre-breathy voice.

<table>
<thead>
<tr>
<th></th>
<th>Word initial trill</th>
<th>W trill</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Num.</td>
<td>PBV</td>
</tr>
<tr>
<td>SDDS</td>
<td>133</td>
<td>47ms</td>
</tr>
<tr>
<td>CDS</td>
<td>107</td>
<td>58ms</td>
</tr>
</tbody>
</table>

The second difference between the dialects relates to the percentage of pre-breathy voice compared to the overall duration of the segment. The CDS pre-breathy voiced durations constituted a slightly higher proportion of the trill segment than in the case of the SDDS dialect. While the CDS dialect had a slightly higher proportion of pre-breathy voice in relation to the trill segment, since the average difference between the dialects was eleven ms or less, and below the accepted durational threshold for a just noticeable difference (JND), no statistical comparison was performed.

5. Discussion

5.1. Acoustic characterization of the SDDS trill

The majority of the trills in the SDDS dialect were produced as pre-breathy voiced rhotics, similar to the report by Willis (2005) for the Cibao dialect. As noted earlier, there were a few productions of trill types produced without voicing; however, these productions were not systematic and variation in the degree of voicing is also reported in characterizations of pre-aspiration. For example, in the pre-aspiration reported for Sienese Italian by Stevens and Hajek (2004), characteristically voiceless, occasionally the pre-aspiration portions of the segment were produced with voicing. Similarly a report of Arjeplog notes variable degrees of voicing in a characteristically pre-aspirated stop (Helgason et al 2003). The presence of these occasional voiceless trill productions along with the considerable number of clearly voiceless apicoalveolar productions initially led me to believe there might be a dialectal difference of the feature voicing. However, upon reflection on the system and identifying the role and contribution of individual variation in the case of the apico-alveolar tokens [], I now believe the few occurrences of a pre-aspirated trill to reflect the variable nature of voicing in segment production.

The next most important acoustic fact concerns the degree of the pre-breathy voiced section of the trill segment. Generalized for all speakers, the pre-breathy voiced portion typically comprised the majority of the overall trill segment. Again this fact is in line with Willis’ (2005) report for the Cibao dialect. It is also important to call attention to the fact that the minimum average duration of the trill segment, including those few tokens that were produced as a tap, was 75 ms. This average trill duration, which is compatible with previous published reports for Spanish trill duration (Blecua 2001, Bradley 1999, 2001, in press, Colantoni 2001, Lewis 2003) across a number of dialects and with respect to overall trill duration, serves to refute Hammond’s claim that there is a neutralization of the tap/trill distinction in Spanish (1999).

As noted by Lipski (personal communication), the allophonic variation of the DS trill data does not follow a set contextual distribution as has long been suggested by some Spanish variationists. In other words, the DS trill data present a free variation of the trill, both within and across speakers, which is in contrast to assertions that allophonic variation in Spanish is exclusively motivated by contextual considerations. The variation manifest in the DS trill data may obtain for two reasons. The first motivation is the complexity of the articulation of the segment. There are two components: pre-breathy voice followed by an apicoalveolar tap. The multiple articulations required to produce the segment may contribute to variations of several different types such as missed articulatory targets or processes of lenition. The second motivation for the observed variation is the semi-spontaneous nature of the speech sample and the use of acoustic software that can precisely identify variations that may not be immediately appreciable. For example, standard characterizations of the DS trill refer to
pre-aspiration, yet acoustic data clearly show a periodic wave form indicative of pre-breathy voice and thereby eliminates a McGurk effect that could potentially cause researchers to overly categorize the segment.

5.2. Dialectal variation of the trill in Dominican Spanish

The comparison of the SDDS and CDS dialects did not reveal the type of marked rhotic variation seen in characterizations of coda rhotics. The SDDS speakers did have a larger inventory of trill types and wider distribution along with idiosyncratic variation. The acoustic comparison also suggested a slight increase in the role of pre-breathy voice in the CDS trill manifest as a larger proportion of the trill segment compared to SDDS trills.

Dialectal variation of the Spanish trill among the educated middle class in the two principle dialects of Dominican Spanish seems to reflect a preference for types as suggested by Alba (1990, 2000) and not wholesale categorical differences. The lack of overt differences in trill production may also reflect Jiménez Sabater’s observation that marked dialectal differences of Dominican Spanish are typically more prevalent among the lower socio-economic levels (1975), and therefore not as observable in the current sample population. Whereas the current study was limited to a small corpus of urban educated speakers, the types and degree of trill variation in Dominican Spanish are still to be determined based on a much larger corpus and considering other sociolinguistic factors such as socio-economic level.

6. Conclusions

This paper finds that the most commonly occurring trill types in educated urban young adults in Santo Domingo Dominican Spanish are produced with pre-breathy voice. The most frequently occurring trill productions in a corpus of 256 tokens of narrative speech across ten speakers were a pre-breathy voiced tap [ɦɾ] and a pre-breathy voiced trill [ɦɾ]. Similar to other characterizations of pre-aspiration in pre-aspirating stop languages such as Icelandic (Thránisson 1978), the duration of the pre-breathy voiced portion constituted the majority of the segment duration. The importance of the pre-breathy voiced component of the segment is recognized by the use of a lower case symbol [ɦɾ] as opposed to a superscript [h³] following the proposal by Ladefoged and Maddieson (1996).

Dialectal variation of the Santo Domingo Dominican Spanish trill when compared to Cibaeño Dominican trill did not reveal major differences. Variation included a tendency to shorten the amount of pre-aspiration in the Santo Domingo dialect and to produce additional token types not found in the Cibao dialect. The comparison of the two dialects suggests a degree of consistency of the characteristic of pre-breathy voice in the production of the Spanish trill among an urban educated young demographic in the two principal dialects of Dominican Spanish.

References

BLECUA FALAGUERAS, BEATRIZ. 2001. Las Vibrantes del Español: Manifestaciones Acústicas y Procesos Fonéticos. Departamento de Filología Española, Universidad Autónoma de Barcelona: Ph.D.

I should note that I did try to collect data from illiterate speakers utilizing the Frog, Where Are You (1969) picture book without much success. The speakers seemed to have a difficult time grasping the concept of a narrative story across a number of pictures. Instead, they would describe each picture as if it were a new story, in one case even when their school-aged children prompted them otherwise.
BRADLEY, TRAVIS. 2001. The Phonetics and Phonology of Rhotic Duration Contrast and Neutralization, Penn State University: Ph.D.


COLANTONI, LAURA MARCELA. 2001. Mergers, chain shifts and dissimilatory processes: palatals and rhotics in Argentine Spanish, Spanish and Portuguese, University of Minnesota: Ph.D.


