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Theme and variation in Jamaican vowels

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ABSTRACT

Reporting the results of an instrumental acoustic examination of the vowel systems of ten Jamaican Creole (or basilect-) dominant and nine Jamaican English (or acrolect-) dominant speakers, this article links phonetic features with sociolinguistic factors. The nature and relative role of vowel quantity and quality differences in phonemic contrast are considered. The question of whether contrastive length operates in speakers' phonological systems is addressed by comparison of spectral and temporal features. Intraspeaker variation in vowel quality is found to play an important role in stylistic variation, demonstrating the complexity of variation in Jamaican varieties. The complex vowel quality (spectral) and quantity (temporal) relations reported here extend our understanding of the spectral and temporal characteristics of vowels involved in phonological contrasts in Jamaican varieties, the range of phonetic variation to be found within a postcreole continuum, and the interaction of phonetic factors in the expression of stylistic variation.

One enduring assumption of linguists inquiring into the phonology of Jamaican Creole has been the phonemic function of vowel length in basilectal varieties to distinguish minimal pairs such as *seat* /siːt/ and *sit* /sit/ (Lawton, 1963; LePage, 1960; Wells, 1973). However, the nature and relative role of vowel quality differences to phonemic contrast in the postcreole continuum has not heretofore received significant research attention. The primary aim of this article is to clarify the nature of vowel quality (i.e., spectral differences) and quantity (i.e., differences in vowel duration) in phonemic contrast for a sample of speakers from different regions along the theoretical postcreole continuum of Jamaica. A secondary aim is to examine how the balance between quality and quantity is affected by stylistic variation. These goals are accomplished through an instrumental examination of the phonetic distinctions speakers make in vowel production. A combined acoustic phonetic and sociolinguistic (or sociophonetic) approach was deemed necessary, not only to arrive at an empirical characterization of the spectral features that correspond to vowel quality, but also to allow for a comparison of phonetic data with sociolinguistic factors likely to correlate with

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TABLE 1. *Accounts of the vowel inventory of Jamaican Creole*

Author	Short Vowel	Long Vowel	Diphthongs	Total Vowels Posited
LePage (1960)	5 /i,e,a,o~ʌ,u/	2 /iː,uː/	4 /ie,ai,ou,uo/	11
Lawton (1963)	5 /i,e,a,o,u/	0	4 /ie,ai,uo,ou/	9
Wells (1973)				
Jamaican Creole	5 /i,e,a,o,u/	5 /iː,ie,aː,uo,uː/	2 /ai,ou/	12
Jamaican Educated	6 /i,e,a,o,u,ɔ/	7 /iː,eː,aː,əː,ɔː,oː,uː/	3 /ai,ɔi,ɔu/	16
Akers (1981)	5 /i,e,a,o,u/	5 /iː,eː,aː,oː,uː/	5 /ie,ei,ai,uo,ou/	15
Lalla and D'Costa (1990)	5 /i,e,a,o,u/	(1) (/aː/)[a]	4 /ie,ai,uo,ou/	9 (10)
Sebba (1993)				
Jamaican Creole	5 /i,e,a,o,u/	5 /iː,ie,aː,uo,uː/	2 /ai,ou/	12
Jamaican Educated	6 /i,e,a,o,u,ɔ/	7 /iː,eː,aː,əː,ɔː,oː,uː/	3 /ai,ɔi,ɔu/	16
Mead (1996)	5 /i,e,a,o,ʊ/	3 /iː,aː,uː/	4 /ie,ai,uo,ou/	12
Veatch (1991)	6 /i,e,a,o,u,ɔ/	6 /ii,ie~eː,aa,ɔː,uo~oː,uu/	2 /ai~ɔiː,ou/	14

[a]Lalla and D'Costa (1990:62) reconstructed Early Jamaican Creole with /aː/, but this vowel was absent from the associated chart several pages later (1990:67).

variation in vowel quality. It is claimed here that a clearer understanding of the basic phonological system of Jamaican Creole necessitates taking sociolinguistic information into account. This article is concerned, then, with both theme and variation. Specifically, what is thematic or basic to the vowel inventory, and what kind of systematicity is associated with the observed variation?

DISPARATE ACCOUNTS

The phonological literature regarding the vowel inventory of Jamaican Creole contains disparate accounts. Table 1 provides a summary of the vowels posited in the extant literature. As may be seen, some authors list as few as 9 vowels in the system, others as many as 16. On the other hand, there is agreement, where acrolectal and basilectal varieties are treated separately (Wells, 1973; Sebba, 1993, follows an analysis based on Wells's inventory), that the basilect utilizes contrastive duration, although authors disagree about the exact number of long and short vowels. Both Cassidy (1961) and Cassidy and LePage (1967) vacillated somewhat on the question of length (Cassidy & LePage 1980) among the low vowel system.

There is wide agreement that Jamaican Creole has a basic 5-vowel system, in which the high front and high back vowels are distinguished by length (for discussions of analyses that do not posit phonemic length, see Lawton, 1963; Sabino, 1996). Disagreement begins with the system of long vowels and carries through the diphthongs. Unlike LePage, who posited long and short values only for the high vowels /i(ː), u(ː)/, Akers (1981) presented a completely symmetrical system with long and short pairs at all positions; his phonemic inventory included two diphthongs with nuclei in the mid front position: downgliding /ie/ and upgliding /ei/ (most authors instead posit high-falling /ie/ alone for the basilect). Wells (1973) also posited a 5-vowel system for the basilect (calling this speech variety "Jamaican Creole"), but departed from the 5-vowel system for acrolect speakers ("Jamaican Educated"). For them, he posited a 6-vowel system of short vowels, including short open /ɔ/, and a 7-member system of long vowels, including long /ɔ/ and schwa. It should also be noted that the system contains no falling diphthongs for Jamaican Educated speakers.

Variation of the sort that emerges from the published accounts may result when speaker samples are not controlled for sociolinguistic factors. Close examination of the literature reveals that the extant accounts give little explicit background concerning the region of origin or social class of participants in the speaker sample. In fact, several studies pool together speakers from basilectal, mesolectal, and acrolectal levels of the theoretical continuum (e.g., Akers, 1981). Sociolinguistic factors, such as style, socioeconomic class, and gender, are well known to have a demonstrable effect on linguistic forms (for introductory discussion of these so-called speaker variables, see, e.g., Fasold, 1990; Milroy, 1980). It is particularly important to control for variation in linguistic research into creole continua, where social dialect differences can mean massive phonological variation: that is, where the varieties spoken range from what is essentially a regional dialect of a superstrate variety (the acrolect) to a non-mutually intelligible substrate (Irvine, 1994).

The discussion will proceed in two parts. First, I provide an acoustic characterization of the phonetic distinctions among vowels produced by speakers of two different demographic types, with the intention of shedding light on vowel quality and quantity characteristics. Vowel quality is characterized acoustically by measuring the first two vowel formants (F1 and F2). Second, I examine data for two sociolinguistic variables, (eː) and (oː), that exhibit stylistic variation within the Jamaican speech community. Results from the two phases of the study are integrated and explained in the conclusion. Of crucial concern to this study are those vowels involved in a putative phonological opposition based on vowel length, where the operation of contrastive vowel length may be investigated.

THE ACOUSTIC STUDY

Speakers

Data were analyzed for 19 speakers, chosen from two locations on the island: one identified as a region where "deep" basilectal speech would be found, the other associated with acrolectal speech (Agorsah, 1994; Beckford Wassink, 1999b; DeCamp, 1961). This step was taken in an effort to isolate varieties as close to the endpoints of the creole continuum as possible. The two resulting subsamples are referred to in this study as basilect-dominant and acrolect-dominant samples.[1] The basilect-dominant sample contained 10 lower working-class speakers (5 female, 5 male) between the ages of 20 and 45. All were born and raised and currently resided in the rural parish of St. Thomas. Speakers' responses to a demographic questionnaire showed them to have kinship ties to this region, a lifetime of social activities carried on within the rural home district, and little contact with tourists and foreign media programming. This was taken as an indication that their webs of social interaction were predominantly rural, giving them little exposure to metropolitan Kingston life (or speech). In addition, speakers specified in the demographic questionnaire that they could speak Patois "very well."[2] For six of these speakers, the highest level of education attained was roughly equivalent to junior high school in the North American context. Two others completed secondary school, and a third entered secondary school but did not complete it. The remaining speaker attended some primary school. An excellent discussion of the relationship between education and social status in Jamaica may be found in Patrick (1999:59–62).

The acrolect-dominant sample contained 9 speakers (5 female, 4 male), all middle class or upper middle class, who resided in urban metropolitan Kingston. Speakers in the acrolect-dominant sample described kinship ties to Kingston (or, for one male speaker, a middle-class neighborhood in Clarendon) as well as a generally urban, Kingston-oriented lifestyle. All were geographically and socially mobile, with social ties in the United Kingdom or the United States. All acrolect-dominant speakers had completed college; three also held masters' degrees.

Materials

Three types of data were collected for the present speaker sample: conversational, word list, and (for the basilect-dominant speakers) picture. First, unscripted, free-flowing conversations were recorded to sample a talker's casual speech, primarily as a check of pronunciations given in the more formal word list task from which vowel data were extracted for acoustic analysis. Speakers participated in self-recruited conversational groups of two to four familiars (following the participant-observation methodology introduced by Blom & Gumperz, 1972). Approximately 25 minutes of casual speech were collected per speaker. Conversational sessions proceeded around topics chosen by the members of the group, with a fieldworker (known to them) directing questions to maintain the flow of the conversation and to allow the investigator to be backgrounded.

These same speakers were then asked to read four repetitions of a 226-item word list. The word list included real CV(:)(r)C monosyllabic target words containing all vowel qualities posited in the literature for Jamaican English and Jamaican Creole, as summarized in Table 1. Words occurred in the Creole carrier frame *Unu rait* ⟨*word*⟩ *pon it* 'You pl. wrote ___ on it'. Target words contained a monophthongal, diphthongal, or *r*-colored vowel elicited with preceding consonants /b, d, k/ and followed by /p, b, t, d, k, g, s, z, n/.[3] Selection of voicing and manner contexts was chosen in line with phonetic (i.e., non-phonemic) factors that might influence vowel length, so that any phonemic vowel length differences might emerge.

Picture data were subsequently collected for the basilect-dominant speakers only, to address any difficulties with reading the word list. The picture task contained 59 cards illustrating as many of the word list items as possible, using pictures from magazines, newspapers, or drawings. Each vowel category was represented at least once. In order to have words appear in relatively consistent stress and phonetic contexts, speakers were asked to tell what they saw on a picture card using the carrier frame *Mi sii a* ⟨*word*⟩ 'I see a ___'. Thus, three tasks were administered to basilect-dominant speakers and two to acrolect-dominant ones. All recordings were made using a Sony DAT Walkman TCD-D8 and AIWA stereo lapel microphone.

Data analysis procedures

Target words were digitized at an 11 kHz sampling rate and low-pass filtered at 5.5 kHz prior to analysis using Soundscope software by GW Instruments. The number of words collected from all sessions (conversational, word list, and picture) that were suitable for acoustic analysis totaled 13,584.[4] Acoustic analysis was followed by auditory analysis to assess the presence or absence of certain features associated with Jamaican Creole and English pronunciation, as I will describe in the sociolinguistic study reported here.

Two types of measurements were taken for vowels in CV(:)C words in order to achieve a spectral characterization of speakers' systems and to investigate the possibility of a length contrast. First, temporal measures were taken. Overall duration of the vowel (in milliseconds, from vowel onset to offset) was the primary temporal measure. Overall duration values for vowels involved in a potential long/short contrast were then used to calculate, for each phonologically long/short pair, a ratio of the duration of the long vowel to the short one (following, e.g., Lehiste, 1970).

Spectral characterization of vowel data constituted the second type of measure. For all data, the first two formants, F1 and F2, were measured at vowel onset, midpoint, and offset. For /aɪ, ɔɪ, ɑʊ, eː, oː/ class words, F1 and F2 were also measured at 12.5 msec intervals to allow for a characterization of the trajectory of these possibly diphthongal vowels.[5] Formant measures were taken from superimposed FFT and LPC spectra using a 25.6 msec window and were confirmed or corrected by visual inspection of a narrowband spectrogram. Direct comparison of acoustic data in Hz across speakers is infeasible due to the effects of sex- and age-related factors (Hindle, 1978). For this reason, all data subjected to acoustic analysis were normalized in order to allow for a comparison of data between speakers and to display vowel data in a manner reflecting aspects of the sensitivity of the human auditory system. The normalization technique followed the uniform scaling algorithm introduced by Nearey (1977) and Disner (1980), which uses log-mean transformed difference values. Normalized values of F1 and F2 for all vowels served as the data for subsequent comparisons and statistical analysis.

Once each vowel distribution was characterized temporally and spectrally, it was possible to compare the distributions of pairs of vowels involved in phonological oppositions to determine whether they were similar or distinct in quality. This was accomplished by determining whether two vowel distributions showed no overlap, partial overlap, or complete overlap in acoustic space using a metric based on ellipse geometry devised by Beckford Wassink (1999b).

No spectral overlap: the distance between the centers of the distributions (i.e., means in F1 and F2) is greater than the sum of their radii, when the radii are extended along the line connecting those centers.

Partial spectral overlap: the distribution of one of the vowels (i.e., the length of its radius) protrudes into the other by a moderate amount. "Moderate" was defined as less than 40%.

Complete spectral overlap: one distribution is contained within the other; that is, both vowel distributions protrude more than a moderate amount (≥40%) into the borders of the other and thus are distributed over the same region in acoustic space.

Next, it was determined what kind of temporal distinction accompanied no overlap, partial overlap, or complete overlap. Data were subjected to repeated-measures mixed model ANOVAs using three sociolinguistic factors and six phonetic ones. Sociolinguistic factors included: group (Kingston, St. Thomas), gender (male, female), and speaker. Phonetic factors included: preceding consonant (/b, d, k/), following consonant (/p, b, t, d, k, g, s, z, n/), vowel (/i, iː, e, eː, a, aː, ɔ, ʌ, oː, u, uː, aɪ, ɔɪ, aʊ/), voicing of following consonant (voiced, voiceless), vowel length (long, short), and vowel quality (high front, high back, low). The last phonetic factor, vowel quality, requires some explanation. Vowels that the acoustic analysis showed to be adjacent to each other in acoustic space and that participated in a phonological long/short opposition (i.e., /iː, i/, /eː, e/, /aː, a/, /oː, o/, /uː, u/) were classified for purposes of comparison as high front, mid front, low, mid back, and high back. Mid front and mid back vowels were eventually omitted from statistical analysis because the distributions were qualitatively different for speakers who produced /eː, oː/ as centering or downgliding diphthongs [ie, uo] from those of speakers who produced monophthongal realizations [eː, oː]. Diphthongal vowel distributions cannot be adequately represented by plotting a single midpoint value. It is unjustified to assess spectral overlap between monophthongal [eː] and diphthongal [ie], as a difference in vowel quality already exists. Furthermore, including spectral values for such vowel quality pairs in statistical analysis would have constituted an inappropriate between-speaker comparison of vowels that were monophthongal for some speakers to vowels that were diphthongal for others.

Findings of the acoustic study

We now turn to the results of the acoustic study. Results are presented for data that were suitable for acoustic and statistical analysis: that is, the normalized values of the pairs of vowels involved in a putative long/short opposition. Only the data drawn from word list are considered. General observations regarding the overall shape and distribution of vowel data are described first, followed by an analysis of the pairs of vowels involved in a long/short opposition by vowel pair and speaker group.

The overall shape and distribution of Jamaican vowel space. The first result, based on visual assessment of the data, was a basic V-shaped vowel system for all speakers in both groups, as illustrated in Figure 1. The plot includes values of normalized F1 and F2 data at vowel midpoint. Both the acrolect- and basilect-dominant speakers' vowels were found to be distributed along a V-shaped space with its apex at /a/, consistent with findings reported by Veatch (1991) for a sample of two urban mesolect speakers. With respect to interspeaker ordering of the vowels within this basic configuration, two basic patterns emerged. The first pattern exhibited a fairly even distribution of vowels along the left and right periphery of the acoustic vowel space, with little spectral overlap between vowel categories (Figure 1). The second exhibited greater clustering of the vowel categories in the high front, high back, and low corner, as typified by the data presented in Figure 2. The first type of system was primarily found in acrolect-dominant (Kingston) speakers, whereas the second was primarily found in basilect-dominant (St. Thomas) speakers. In the next two sections, spectral and temporal relationships between vowel categories are considered more closely.

Spectral overlap. The spectral overlap metric was used to quantify the protrusion of one vowel category into another, enabling an assessment of acoustic similarity of vowels involved in phonological long/short oppositions (of vowels in the high front, high back, and low subsystems) in terms of complete, partial, and no spectral overlap. Each subsystem was examined separately for each speaker, and results were then compared across speakers. In the comparisons that follow, acrolect-dominant speakers are identified by a unique number preceded by K (indicating Kingston-oriented network ties) and basilect-dominant speakers by a unique number preceded by T (indicating St. Thomas-oriented network ties).

For cases classified as showing complete spectral overlap, vowels tended to show a difference in mean F1 of around 45 Hz or less, concomitant with a difference in mean F2 of around 90 Hz or less. Crucially, one standard deviation from the mean for either F1 or F2 would close the distance between the means almost entirely. For example, basilect-dominant speaker, T1, showed complete spectral overlap in /iː, i/. Figure 3 illustrates the types of distributional patterns classified by the overlap metric, comparing data for speaker T1 to data for speakers T2 and K4. The difference between F1 means for T1's /iː, i/ was 34 Hz and between F2 means, 88 Hz.[6] Deviations for F1 of /iː, i/, respectively, were 34 Hz and 37 Hz and for F2, 82 Hz and 113 Hz. For the partial overlap case (e.g., data for T2), the means for F2 more closely approximated each other than did the means for F1. The difference between F1 means was 72 Hz and between F2 means, 50 Hz. Deviations for F1 of /iː, i/, respectively, were 33 Hz and 36 Hz and for F2, 158 Hz and 138 Hz. By contrast, the differences for means of vowel pairs that were evaluated as spectrally non-overlapping (e.g., data for K4) typically exceeded 60 Hz for F1 and 200 Hz for F2.

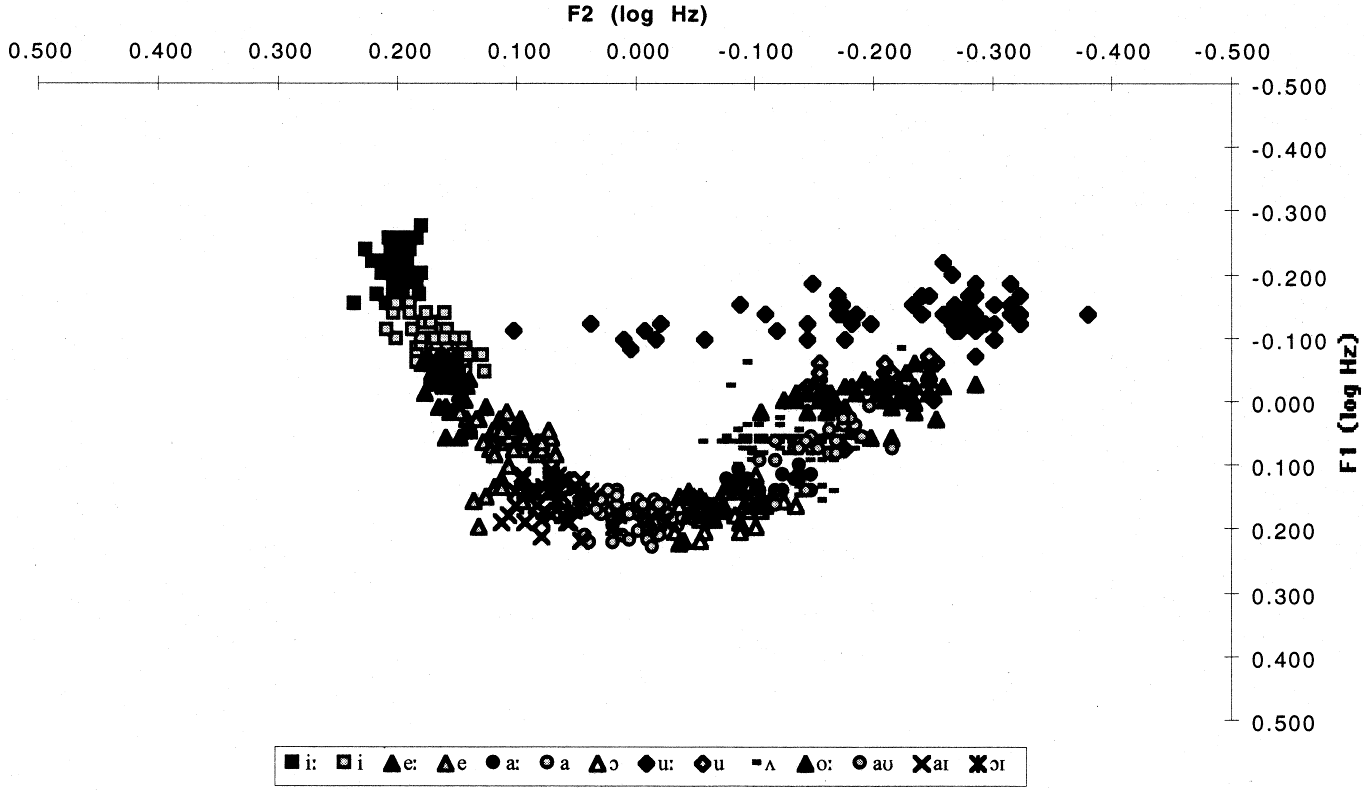

FIGURE 1. Normalized vowel formant frequencies for male acrolect-dominant speaker K5 showing distribution of vowels along the periphery of a V-shaped acoustic space.

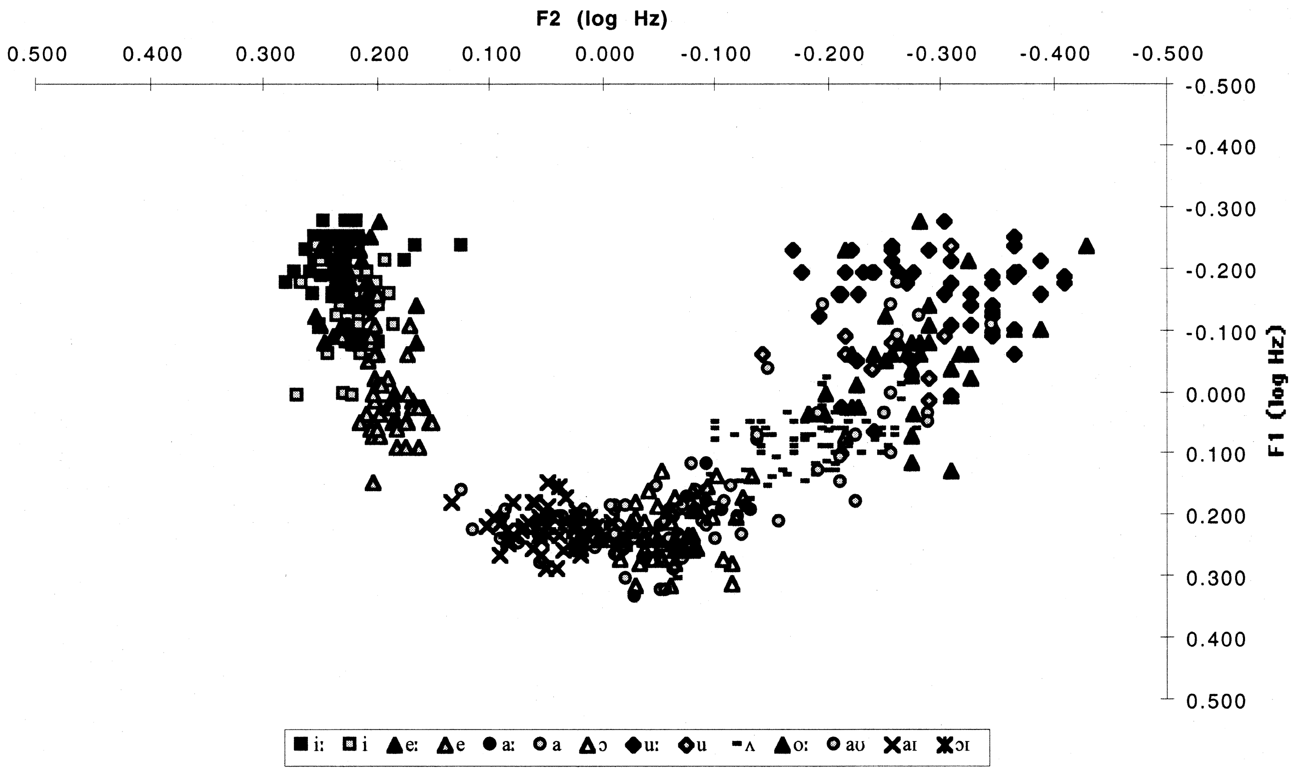

FIGURE 2. Normalized vowel formant frequencies for male basilect-dominant speaker T1 showing clustering of vowels in high front, low, and high back regions of acoustic space.

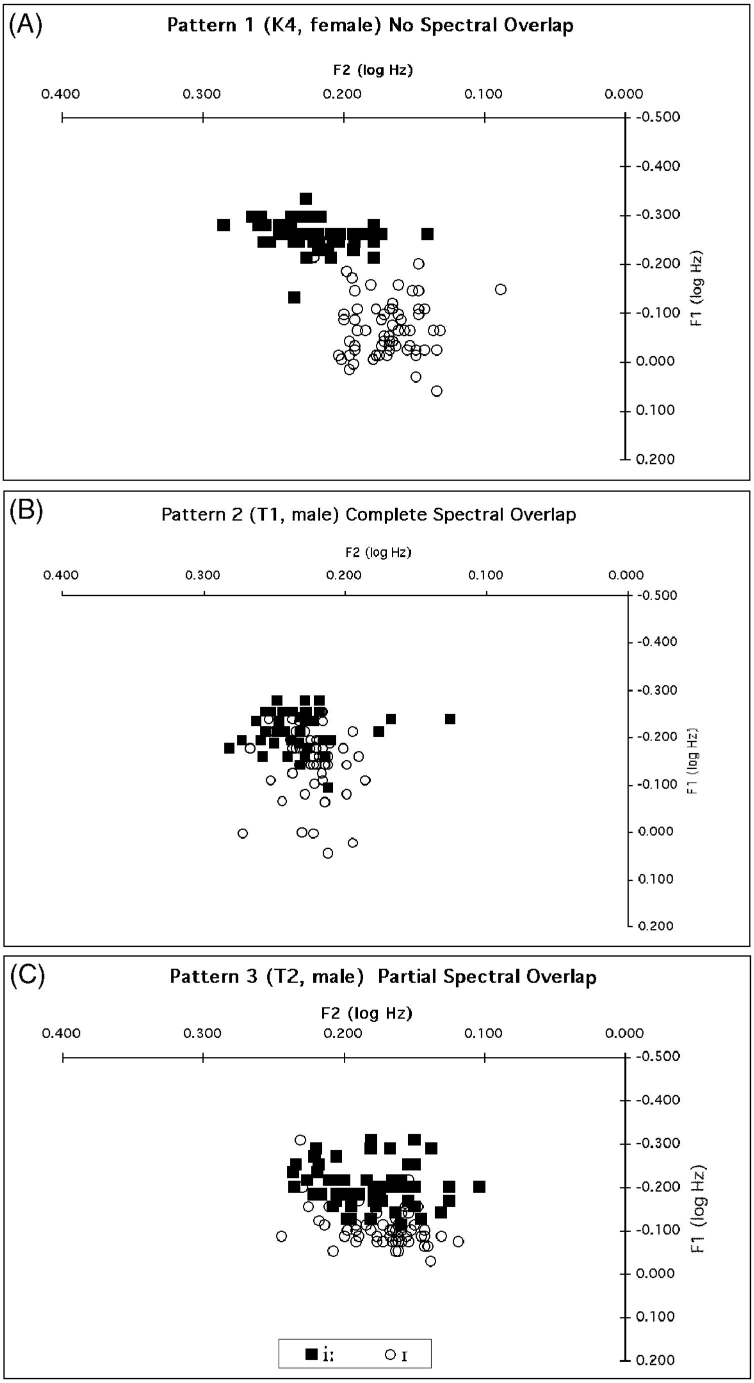

FIGURE 3. Spectral patterns associated with /iː, i/.

Table 2 presents, for both groups, the percentage of speakers who were classified as showing no spectral overlap, partial overlap, or complete overlap for each subsystem pair. Most strikingly, perhaps, Kingston speakers showed no occurrence of complete spectral overlap for two of the three vowel quality categories submitted to repeated measures ANOVA: /iː~i, aː~a/. The predominant trend of these speakers was partial spectral overlap for the high front pair and no spectral overlap for the low pair. High back vowels for these speakers were classed as showing primarily partial or complete spectral overlap. The predominant pattern for high front /iː, i/ in both acrolect- and basilect-dominant speakers was partial spectral overlap (78% and 80% of speakers in each subsample, respectively).

Data for the mid front subsystem, containing /eː, e/, were not subjected to statistical analysis because of the potential for vowel quality differences between speakers associated with downgliding, as was mentioned earlier. [ie] is already spectrally distinct from [ɛ] because of the dynamic nature of the trajectory from onset to offset that gives [ie] its diphthongal character, as may be seen in Figure 4. Kingston and St. Thomas speakers did vary in their realization of /eː/, some producing it as a monophthong on some occasions but as diphthongal [ie] on others, as I will discuss in the sociolinguistic study. However, it is possible to comment on the relationships between these vowels in those cases where speakers did produce both as monophthongs. Four Kingston speakers (K2, K4, K5, and K7) produced /eː/ consistently as a monophthong in the word list session. These speakers showed a strong tendency to distinguish their vowels spectrally (i.e., 78% of the vowels showed no spectral overlap, 11% partial overlap, and 11% complete overlap). No St. Thomas speaker produced all /eː/ words with monophthongs, but three females (T3, T4, T8) did produce more than 95% of their word list tokens as monophthongs. These St. Thomas speakers showed a strong tendency toward partial overlap (20% of the vowels showed no spectral overlap, 70% partial overlap, and 10% complete overlap). For speakers in both groups, /e/ was produced with a lower F2 than /eː/, indicating a more central location in acoustic space. Interestingly, several speakers with a tendency toward greater spectral clustering in their overall system (four basilect-dominant speakers, including T1, whose vowel system is illustrated in Figure 1, and one acrolect-dominant female speaker, K1) actually overlapped words in the /eː/ class, not with /e/ but with the high front vowels /iː, i/.

In the low vowel subsystem, vowel distributions for /aː, a/ tended to overlap either completely or partially for St. Thomas speakers, whereas Kingston speakers showed mostly no or partial overlap. Interestingly, St. Thomas speakers' /aː, a, ɔ/ tended to be very similar both in F1 and F2, whereas these vowels were spectrally quite distinct for Kingston speakers. This effect arose because F2 of /aː/ was generally lower for Kingston than for St. Thomas speakers, with Kingston females showing the lowest values overall, indicating the most backed productions phonetically (i.e., [ɑː], [ɒː]). This effect was statistically significant when subjected to a multivariate ANOVA: Vowel × Group × Gender, $F(2,74) = 5.47$, $p < .01$. When taken together with the temporal results for these vowels, these data suggest that the CAT and COT classes may be merged for some basilect-

TABLE 2. *Percentage of speakers in Kingston and St. Thomas groups showing no, partial, or complete spectral overlap for the three vowel quality subsystems submitted to statistical analysis (Kingston*, n = 9*; St. Thomas*, n = 10*)*

	No Spectral Overlap		Partial Spectral Overlap		Complete Spectral Overlap	
Vowel Quality Subsystem	Kingston	St. Thomas	Kingston	St. Thomas	Kingston	St. Thomas
High front /iː, i/	22%	10%	78%	80%	—	10%
Low /aː, a/	56%	—	44%	60%	—	40%
High back /uː, u/	12%	—	44%	30%	44%	70%

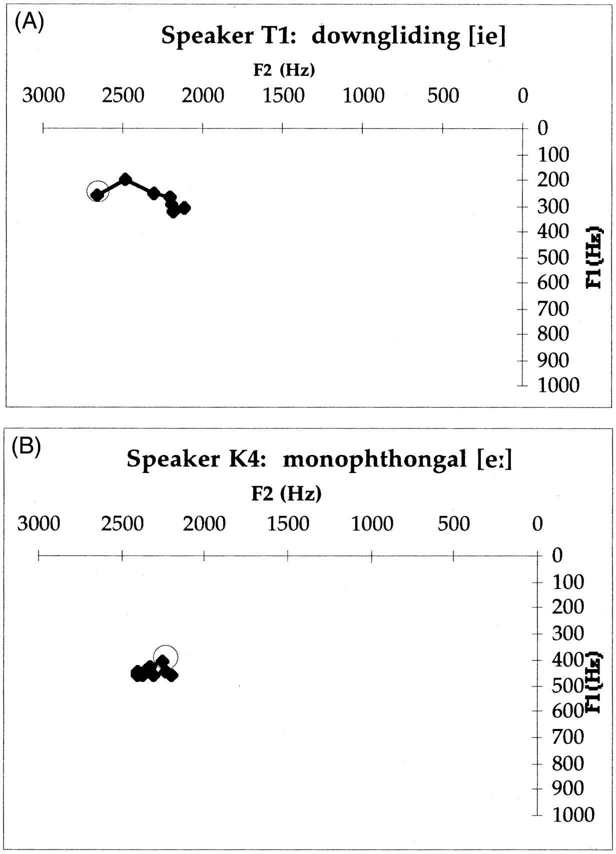

FIGURE 4. Plot of successive spectral measurements for (A) downgliding [ie] produced by basilect-dominant speaker T1 in *babe* and (B) monophthongal [eː] produced by acrolect-dominant speaker K4 in *babe*. Plotted points represent successive 12.5 ms interval measures from diphthong onset to offset; onset position is circled.

dominant but not for acrolect-dominant speakers (Patrick, 1999:101–104; see also Beckford Wassink, 1999b, for a discussion of palatalization of /a/ in the CAT class for some basilect speakers).

Somewhat surprisingly, the word list data provided evidence for a distinct /ʌ/ class for Jamaican speakers. Words in the CUT class exhibited either no or partial spectral overlap with neighboring /ɔ/ for all speakers except one. In addition, F1 × F2 means for /ʌ/ showed partial spectral overlap with /oː/ for 11 speakers (4 Kingston, 7 St. Thomas) and no spectral overlap for the remaining 8 (5 Kingston, 3 St. Thomas). Cases of no spectral overlap entailed a difference in F1 of 131 to 196 Hz with a concomitant difference in F2 of 243 to 371 Hz. Partial spectral overlap was assessed for F1 differences between 56 and 168 Hz with concomitant F2 differences of 113 to 273 Hz.

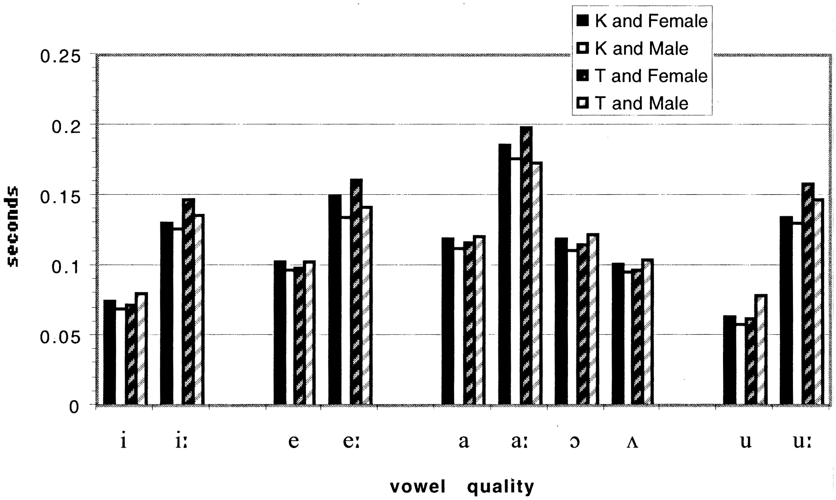

FIGURE 5. Mean vowel durations grouped according to group and gender.

Data for the mid back subsystem, containing /aʊ, oː/, were not subjected to statistical analysis, as they did not constitute a phonologically long/short pair. However, data were inspected visually and overlap patterns were compared. Data for these diphthongs were scattered over a wider range than all other vowels, primarily due to extensive variation in vowel height (inversely related to F1). Vowels in /aʊ/ or HOUSE class words were variously realized as monophthongs [oː] and upgliding diphthongs [oʊ, ou] by acrolect-dominant speakers and as monophthongs or downgliding or centering diphthongs [uo, ʊo, ʊə] by basilect-dominant speakers. Spectral features for this vowel tended to be quite similar to /oː/. These categories were assessed as showing partial spectral overlap for all but three speakers, for whom they overlapped completely.

Finally, for the high back subsystem, containing /uː, u/, complete spectral overlap was the predominant trend for basilect-dominant speakers (70%), although cases were found among the acrolect-dominant speakers as well. As was the case in the low subsystem, non-overlapping categories were only to be found among Kingston speakers.

Temporal overlap. I now turn to the temporal characteristics of the vowels for the present sample of Jamaican speakers, especially as they relate to phonological long/short pairs. Of the spectral and temporal variables studied, differences between acrolect- and basilect-dominant speakers emerged most clearly in temporal vowel properties.

Overall, vowel durations for short, lax vowels /i, e, a, u/ averaged 73, 99, 118, and 64 ms, respectively. Corresponding tense vowels /iː, eː, aː, uː/ averaged 134, 147, 184, and 142 ms, respectively. Figure 5 provides duration data for all vowel

TABLE 3. *Mean duration ratios in Kingston and St. Thomas groups for the three vowel quality subsystems submitted to statistical analysis*

Vowel Quality Subsystem	Kingston	St. Thomas	Level of Significance (*p* value)
High front /iː, i/	1.84 : 1	1.91 : 1	.03
Low /aː, a/	1.52 : 1	1.59 : 1	.03
High back /uː, u/	2.27 : 1	2.27 : 1	*ns*

qualities. Multivariate ANOVAs conducted for the high front, mid front (for monophthongal productions of (eː) only), and low qualities indicated that the differences in the overall duration of St. Thomas speakers' phonologically long and short vowels were significantly greater than those of Kingston speakers. Specifically, between-group differences attained a p value of better than .03 in each case, as is shown in Table 3. Duration differences between vowels in the high back subsystem did not significantly differ between groups. Interestingly, when each vowel quality was considered individually, durations for St. Thomas speakers' vowels were consistently significantly longer than those for Kingston speakers' vowels. In fact, the mid front and low vowels showed vowel-by-group interactions, indicating that it was the long vowels that were contributing most to this difference between groups. In other words, whereas St. Thomas speakers' short and long vowels were both longer than Kingston speakers' vowels, their long vowels were particularly longer. Therefore, for three of the four vowel quality groupings involving a phonological long/short contrast, St. Thomas speakers showed larger duration ratios.

As I mentioned before, the pair /a, ɔ/ was found to show complete spectral overlap for several speakers. This was the only vowel pair that also showed complete temporal overlap for these speakers. In the absence of other data to rule out the possibility that a phonetic distinction is being maintained in another dimension (e.g., fundamental frequency or f0), these data suggest that these classes are in, or approaching, phonemic merger (DiPaolo & Faber, 1990).

In order to understand the significance of the duration ratios just provided, it may prove instructive to introduce temporal information for other linguistic varieties. American English /i/ and /ɪ/ as in *beat* and *bit* are understood to differ in vowel quality, so that they are spectrally distinct (/i/ is classified as high front, with /ɪ/ slightly lower in acoustic vowel space). However, in American English, these sounds are also produced with a systematic difference in length, so that /i/ is longer than /ɪ/. This spectral/temporal interaction is characteristic of the tense/lax distinction in this variety. In other words, vowel length in American English is not phonemic because it always accompanies a significant quality distinction. The ratio of long /i/ to short /ɪ/ in American English has been reported to be about 1.2 to 1 (Hubbard, 1998). A ratio of about 1.6 to 1 across all long/short oppositions in a language is regarded as the lower bound for languages with a length distinction, when this length distinction is accompanied by partial or complete spectral overlap.

Both subsamples of Jamaican vowel data analyzed in the present study fall closer to this contrastive duration of 1.6 to 1. However, with respect to each other, the overall duration ratios do not appear to be notably different: 1.59 to 1 for acrolect-dominant (Kingston) speakers versus 1.66 to 1 for basilect-dominant (St. Thomas) speakers. However, with the exception of the high back vowels, the differences by vowel quality are statistically significantly different. This temporal information must be taken together with the spectral findings. Whereas the Kingston speakers showed vowel quality (i.e., spectral) distinctions of more than 40% on average for three oppositions (high front, mid front, and low), primarily in F1, the vowel quality distinctions of the St. Thomas speakers were smaller in magnitude, with complete spectral overlap observed for all vowel qualities. This suggests that spectral distinctiveness may not play as prominent a role in vowel quality contrasts for basilect-dominant speakers as it does for acrolect-dominant ones. It remains to be seen what role these distinctions play in perception.

To sum up thus far, an acoustic comparison of vowel quality distinctions made in a controlled word list task using monosyllabic targets suggests that the St. Thomas speakers showed a greater tendency toward spectral overlap of long/short pairs than did the Kingston speakers. However, both groups showed some spectral distinctions (consistent with findings of Lehiste, 1970). This is interesting because it suggests that basilect-dominant and acrolect-dominant speakers alike use vowel quality to distinguish at least some vowels, whatever the contribution of durational features.

A basic V-shaped distribution of vowels in acoustic (F1 $\times$ F2) space was found for all speakers. Two patterns were isolated within this basic configuration, distinguished by a fairly even distribution as opposed to a clustering of vowels in the high front, low, and high back regions. Although general, group-related patterns emerged from the data, interspeaker variation with respect to overlap patterns among vowels, grouped in five vowel subsystems for comparison, necessitated a detailed investigation of vowel quality overlap.

The present analysis, by combining visual assessment of vowel system data, quantification of spectral and temporal overlap, and auditory analysis, provides data regarding phonetic distinctions that can support phonological analysis. The phonetic data are interpreted as indicating that acrolect-dominant speakers in the present sample generally maintain 13 or 14 spectrally distinct vowel qualities: 6 short /i, e, a, ɔ, ʌ, u/, 5 long /iː, eː, aː, oː, uː/, and 2 diphthong /aɪ, ɔɪ/. Basilect-dominant speakers distinguish 11 or 12 qualities: 5 short /i, e, a, ʌ, u/, 3 long /iː, aː, uː/, and 3 diphthong /ai, ie, uo/. These phonetic distinctions are schematized in Figure 6. Commas separate phonemes that are spectrally overlapping at the nucleus of the vowel but are kept distinct temporally or by means of an offglide for the relevant speakers, and slashes separate phonemes that are spectrally and temporally overlapping (i.e., possibly merged).

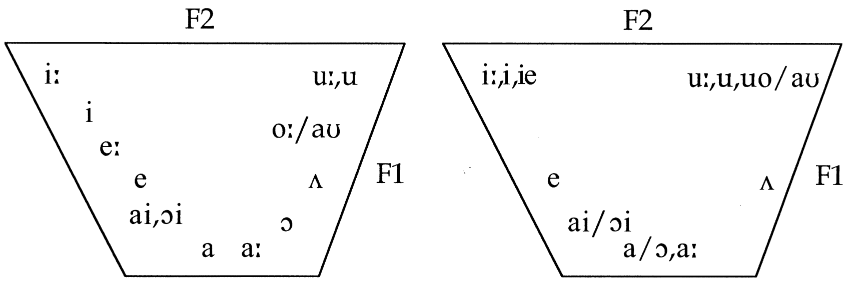

FIGURE 6. Schematic inventory of phonetic distinctions for acrolect-dominant speakers showing little spectral overlap (left) and for basilect-dominant speakers showing clustering in high front, high back, and low corners of acoustic space (right).

The temporal results suggest that basilect-dominant speakers are maintaining duration distinctions for all oppositions, with the possible exception of /a, ɔ/.[7] This analysis most closely agrees with that of Wells (1973), who posited a difference in the number of phonemic contrasts for acrolect- and basilect-dominant speakers. The present analysis departs from Wells's study, however, by including the phone /ʌ/ in the vowel inventories of both acrolect- and basilect-dominant speakers.

Rather than positing that basilect-dominant speakers maintain contrastive vowel length and acrolect-dominant speakers do not, it seems more accurate to say that both groups utilize duration contrasts to an extent similar to speakers of languages with phonemic vowel length. In other words, duration possibly plays a greater role relative to spectral distinctions than in varieties of English such as American. This fact is taken as phonetic evidence for a length contrast in three regions (high front, low, and high back), as was suggested by Mead (1996). At the same time, basilect-dominant speakers show smaller spectral differences between opposing pairs in three subsystems.

THE SOCIOLINGUISTIC STUDY

Part of the difficulty in describing the phonology of Jamaican Creole, as we saw from the disparate phonemicizations reported earlier, relates to the characterization of the (eː) and (oː) classes. These phonemes are frequently realized as either diphthongs or monophthongs in Jamaican varieties and, as a result, show the greatest spectral variation in the vowel system. Previous research has indicated that these phonemes, in addition to postvocalic *r* and (KYA), function as sociolinguistic markers in Jamaican varieties (Patrick, 1992). It is to the spectral and temporal features of the two sociolinguistic variables (eː) and (oː) that the investigation now turns.[8] Can a basic phonetic realization of these forms be identified? This question is addressed by examining stylistic variation in these forms.

The extant literature on Jamaican phonology indicates two possible broad phonetic realizations for (eː) and (oː): downgliding or centering [ie], [uo] or monophthongal [eː], [oː]. As indicated in Table 1, the accounts differ, however, in whether they posit the downgliding or the monophthongal realization as basic to the inventory. (They entirely neglect the possibility of alternation according to style.) Wells (1973) suggested discrete associations between monophthongal and downgliding/centering variants, associating [ie] with Jamaican Creole speakers (basilectal) and [eː] with acrolectal ones. Analysis of the distribution of monophthongal versus diphthongal variants shows (eː) and (oː) to be sensitive to register demands. Examination of within-speaker variation across word list, conversational, and picture tasks allows us to characterize this stylistic variation.

Methods

The same speakers who participated in the acoustic study supplied the data for the sociolinguistic study: two groups, acrolect- and basilect-dominant, males and females in each, for a total of 19 speakers. Whereas only word list data were examined in the acoustic study, data for the sociolinguistic study included data from casual and formal settings for each speaker. The word list data included the materials collected and described earlier in the acoustic study. Conversational data consisted of approximately 25 minutes of unscripted, free-flowing conversation for all speakers. Conversations were conducted in dyads or small, self-recruited groups, following the participant observation methodology of Blom and Gumperz (1972). Data were collected and measured as described before. The word list and conversational data were collected to enable comparisons across formal and informal stylistic contexts. A third task was added for St. Thomas speakers only. Because it was likely that at least some basilect-dominant speakers would have difficulty reading the word list, a picture task was included for the St. Thomas speakers. Pictures were displayed on index cards and came from drawings or photographs matching as many word list items as possible. The target word was printed on the card to increase the likelihood of eliciting it. Speakers were asked to tell what they saw on the card in a constant carrier phrase *Mi sii a/wan ⟨word⟩* ‘I see a ⟨word⟩’. Because speakers were asked to describe each picture using this standardized sentence, it was expected that the picture task would elicit similar forms to the formal word list task, in which target words were embedded in a carrier frame.

Words matching those of the word list (and for St. Thomas speakers, pictures) were extracted from the conversational recordings in order to provide data that were roughly comparable between tasks with respect to phonetic environment. Target vowels were subjected to acoustic analysis and a subsequent auditory analysis. The auditory analysis of (eː) and (oː) was undertaken so that the coding of all tokens would be downgliding, upgliding, or monophthongal. In this study, the classification “downgliding” included, for both markers, those target items that speakers realized with either downgliding or centering production: that is, for (e:), [ie, $\text{e}^{ə}$, $\text{i}^{ɛ}$], and for (oː), [uo, ʊo, ʊə, $\text{u}^{ə}$, $\text{o}^{ə}$]. Because consonants that flank a

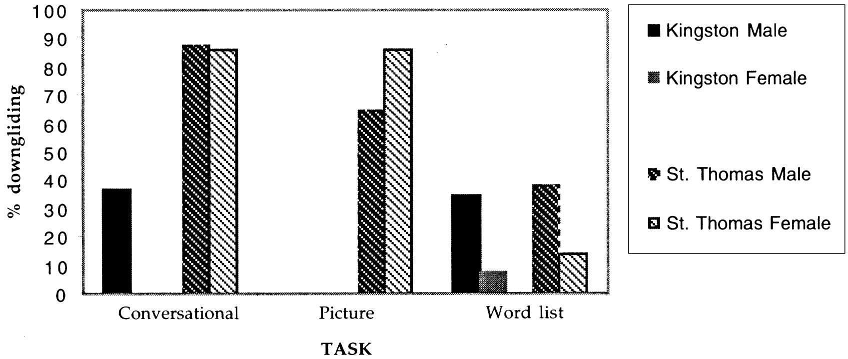

FIGURE 7. Mean percentage of downgliding productions for marker (eː), by group and task.

vowel may cause formants to shift quickly so that they visually resemble diphthongal vowels, gliding could not be reliably assessed from the acoustic analysis alone. Although conversational vowel data were produced in similar phonetic contexts, target words occurred in different intonational contexts (with respect to stress and position in sentence). In addition, the datasets for each task contained differing numbers of tokens. For these reasons, statistical tests were not appropriate for strictly assessing the magnitude of difference between the spectral and temporal properties of the conversational data. Results are therefore presented in terms of general patterns emerging from auditory and visual (i.e., from the sound spectrograph) inspection of the data.

Results

Comparison of the phonetic realizations of the sociolinguistic markers (eː) and (oː) points to stylistic variation similar in several respects to that found in studies in the variationist literature (beginning with Labov, 1966). Specifically, for both (eː) and (oː), the frequency of the downgliding variant differed according to the formality of the task. Figure 7 shows that overall for (eː) the monophthongal variant [eː] emerged more frequently in the word list task than in the conversational task. This variant has been historically associated with middle-class acrolect-dominant speech. Indeed, Kingston speakers showed a predominance of monophthongal forms in both sessions.

Notably, not a single downgliding variant of (eː) was produced in the conversational session of any of the acrolect-dominant female speakers. In their word list sessions, Kingston females realized fewer target words than all other groups with downgliding or centering [ie] (mean downgliding = 7.5%). Three of four females showed no downgliding whatsoever in the word list, but the fourth did show downgliding; in fact, she produced more downgliding than three of five male Kingston counterparts.

The acrolect-dominant male speakers exhibited slightly more downgliding in their conversational sessions than in their word list sessions, with an average of 37.5% for the conversational task versus 35.2% for the word list task. However, it must be mentioned that monophthongal productions ranged from 0% to 93% in the word list task. Four of five males produced less than 50% downgliding variants, but the fifth produced 93%.

By comparison, male and female basilect-dominant speakers showed a great deal more downgliding variants in their conversational data than in their word list data. The percentage of downgliding productions in the conversational session averaged 87.2% for male speakers and 86.2% for female speakers. Picture task data yielded 64.7% downgliding variants for males, fewer than were produced in their conversational data. Females averaged 86.0% downgliding forms in their picture task, a level consistent with that of their conversational data. Unlike the acrolect-dominant speakers, no basilect-dominant speaker produced exclusively monophthongal variants in the word list data. Downgliding variants in the word list session averaged 38.8% for male speakers and 13.4% for female speakers.

It may first be noted that, taken together, these data show a trend related to group, with St. Thomas speakers using more downgliding variants in all sessions than Kingston speakers and showing a greater magnitude of variation between conversational and word list tasks. Second, there is also a trend related to gender. Across groups, males produced more downgliding variants than females did in the word list and conversational sessions. It is interesting that males and females pattern together, regardless of group. When the results for (eː) are viewed in terms of the magnitude of difference between styles, it is the females of the two groups that differ most greatly. Female St. Thomas speakers' average downgliding productions exceeded those of female Kingston speakers, with a between-group difference of 86.2% in the conversational session and 14.6% in the word list. Males of the two groups showed a less marked difference: 49.7% in the conversational session and 3.6% in the word list.

Interestingly, the trend noted here (males producing more downgliding forms than females) was not maintained in the picture task for the basilect-dominant speakers. While it was expected that the picture task would yield results similar to those of the word list, the results showed the same levels attained in the conversational data for the females and somewhat lower levels for the males. Thus, in this task, females had a higher frequency of downgliding variants than males. This pattern is discussed further later.

Stylistic variation of a rather similar nature emerged for the second variable, (oː). As may be seen in Figure 8, monophthongal variants were concentrated again in the word list session, with speakers in both groups producing, on average, fewer than 50% downgliding forms. Furthermore, both male and female Kingston speakers again produced mostly monophthongal [oː] in both the word list and conversational sessions. Note, however, that male acrolect-dominant speakers showed less downgliding of (oː) in their casual speech than they did for (eː): 10.6% for (oː) versus 37.5% for (eː). As was the case for (eː), female acrolect-dominant speakers produced no downgliding variants for this variable in their conversational data.

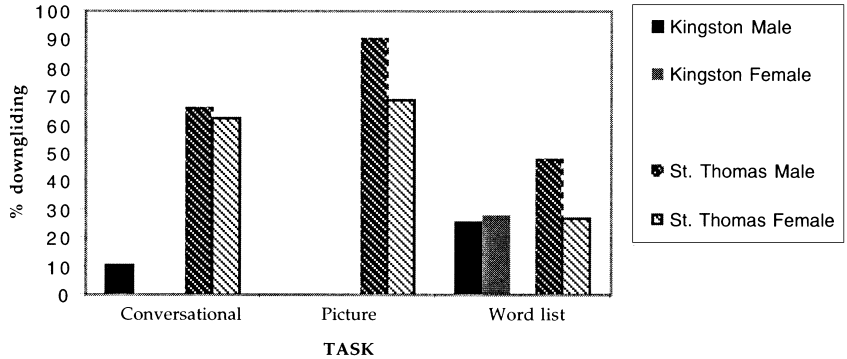

FIGURE 8. Mean percentage of downgliding productions for marker (oː), by group and task.

The St. Thomas speakers showed a pattern of more downgliding in casual speech than in the word list. Downgliding forms in the conversational task averaged 62.6% for females and 65.9% for males. Female basilect-dominant speakers showed 27.4% downgliding forms in the word list, and their male counterparts showed 47.7%. Downgliding [uo] among acrolect-dominant speakers in the word list averaged 28.0% for females and 26.2% for males. Thus, from casual speech to word list, the percentage of downgliding forms for (oː) showed a similar marked decrease for the St. Thomas speakers as was observed for (eː). Unlike the results for (eː), where male speakers of both groups produced more downgliding forms in their word list sessions than female speakers did, male and female acrolect-dominant speakers showed similar levels of downgliding variants for (oː), similar to each other as well as to basilect-dominant female speakers.

Picture task data for the basilect-dominant sample showed a different pattern from word list data. Female speakers averaged 69.1% downgliding productions, whereas male speakers averaged 90.0%. As was found for (eː), female speakers showed similar levels of downgliding in their conversational and picture tasks. However, male speakers produced more downgliding forms for (oː) than for (eː), although they produced more forms in both cases. Thus, the gender differences in the picture data for (oː) are similar in direction to the trend for (eː) in the word list and conversational sessions: that is, males showed a higher average of downgliding variants.

DISCUSSION

Downgliding (eː), (oː) has historically been discouraged in formal settings as rural, uneducated pronunciation. Jamaican speakers are aware of this linguistic norm as well as the ways in which this feature serves to distinguish Jamaicans from speakers in other West Indian territories. It is interesting, therefore, that downgliding (eː), (oː) emerged in the word list sessions at all. It may be that this predominance of [eː] in the word list sessions, particularly for basilect-dominant speakers, reflects one often-reported finding of variationist sociolinguistics: in their casual speech, speakers of lower socioeconomic classes tend to converge on the middle-class norm in their careful speech (Labov, 1966). Results of the word list task for the present sample of basilect-dominant speakers clearly show productions of the prestige variant that are not categorical but of higher frequency than in casual registers. With the exception of downgliding variants of (oː) for the male members of this group, the basilect-dominant speakers' levels of production of downgliding variants in the word list session are quite similar to those of their acrolect-dominant counterparts.

Second, group and gender effects (and associated interactions) were found. For both sociolinguistic markers, the downgliding variant was realized with greatest frequency in the casual speech of the basilect-dominant subsample, as might be expected. Interestingly, however, the gender difference observed among the St. Thomas speakers in the word list (i.e., careful speech, where females consistently produced fewer downgliding forms than males) was not evident in the conversational data (where females produced downgliding forms with similar frequency to males).

It has been argued that casual speech (sometimes referred to as a speaker's vernacular) is the most representative, consistent code a speaker will use (Labov, 1972, 1984). It may be, then, that the disappearance of a gender-correlated difference with decreased formality of task reflects the most representative forms for those basilect-dominant speakers, thus revealing [ie, uo] to be basic to basilectal Creole. Female acrolect-dominant speakers showed less downgliding in the conversational sessions than in the word list. It may be possible to interpret this as reflecting speaker avoidance of [ie] in an informal setting (i.e., this variable attracts heightened attention to speech, even in informal settings, given its highly stigmatized nature). However, it is at least as likely that this reflects hypocorrection (in the direction of a basilectal Creole norm) on the part of one speaker, resulting in a higher level of downgliding in her word list session than might be expected among upper middle-class females. All realizations of downgliding [ie] in the word list productions of Kingston female speakers were produced by a single individual, K1. In the conversational session, her realizations were entirely monophthongal, as were all those of her female Kingston counterparts. While the precise import of this fact remains unclear, it is interesting to note in light of the reported increase of favorable attention to Jamaican Creole forms brought on by changing attitudes toward Jamaican Creole and Jamaican popular culture (Beckford Wassink, 1999a; Christie, 1995).

The present data suggest that both basilect-dominant and acrolect-dominant speakers show stylistic variation. This is clearest for the basilect-dominant speakers for both variables. Somewhat surprisingly, male acrolect-dominant speakers showed little stylistic variation for (eː), and female acrolect-dominant speakers showed variation in a direction contrary to what might be expected for formal and informal contexts, given the stigmatization of the variables under study. Possible explanations for this were considered here, but additional research examining stylistic variation for speakers in the Jamaican postcreole continuum seems called for.

It is well worth considering the results obtained for the picture task. For both variables, (eː) and (oː), the average frequency of downgliding forms in the picture task seemed to map more closely to (and indeed in some cases to exceed) the conversational task. This finding runs counter to the expectation that picture task data would provide responses similar to word list data for basilect-dominant speakers. It was anticipated that, because the picture and word list tasks both involved use of a carrier frame, with each sentence differing only with respect to the target word, that respondents might produce their most careful styles for this context. It seems possible that the results obtained reflect the fact that the picture task was not read. Instead, respondents frequently provided the desired sentence form (i.e., *Mi sii a/wan ⟨word⟩*) and proceeded to give a description of the objects or action portrayed in the picture. Respondents were not discouraged from such elaboration. Thus, the task was much more interactive than the word list session. If this were the case, then the results may have been similar to those of the conversational session because the picture task tapped into a similar stylistic level as the conversational session.

THEME AND VARIATION IN JAMAICAN VOWELS

It has been argued here that a sociophonetic approach may facilitate an understanding of what phonetic forms are representative of or thematic to the vowel systems of the present sample of Jamaican speakers. Acoustic analysis, supplemented by an examination of stylistic variation, may help to clarify the spectral and temporal nature of phonemic contrasts in the system as well as the range of variation in phonetic realizations associated with sociolinguistic factors. Stylistic variation of the type seen in (eː) and (oː) was not found for the other vowels in the system. The magnitude of variation observed in production of a phoneme, with key sources of phonetic variation controlled, may thus provide a clue to the operation of sociolinguistic markers in the system. More research is necessary to test the findings presented here. To allow for control of as many phonetic factors as possible, vowels were elicited in monosyllabic words. However, a fuller understanding of spectral and temporal interactions will require an examination of polysyllabic forms as well, which would allow for an investigation of a greater quantity of conversational data. In addition, the investigation needs to be extended to other age groups. It is as yet unknown whether older or younger Jamaican speakers show similar stylistic variation to that described for the present sample of young adult speakers.

One point that emerges perhaps more clearly for linguists working on a post-creole continuum variety than for ones working on other languages is that it can be extremely problematic to use one variety of a creole as a reference for the whole language, as this may result in disparate phonemicizations of a language.

Studying variation within the Jamaican continuum essentially entails study of a language variety with a range of regionally and socially determined forms that differ widely from each other. When sociolinguistic variation such as this is taken into account, apparent disparities in accounts may begin to be reconciled.

NOTES

1. It is not possible to make discrete divisions among acrolectal, mesolectal, and basilectal forms. For convenience, yet without grossly misrepresenting the fact that many Jamaican speakers are bidialectal, I use the designations "basilect-dominant" and "acrolect-dominant."
2. Jamaican Creole is widely referred to as Patois by native speakers. Thus, "Patois" was the term employed in the demographic questionnaire.
3. Jamaican Creole /k, g/ are known to be palatalized before /a/ for some speakers, varying according to sociolinguistic factors (Patrick, 1992). The voiceless velar, /k/, was included in the paradigm for this study because it provided a greater number of real-word tokens, representing more of the vowel inventory and occurring in the desired phonetic environments than its voiced counterpart. Examination of palatalization was of interest to the larger study, but is not reported here.
4. It was anticipated that level of literacy might pose a problem for some basilect-dominant speakers in completing the word list task. Of the 10 basilect-dominant speakers, three speakers, T1, T2, and T4, showed notable difficulty. The quantity of data lost due to mispronunciation was about 12 words per speaker (or 5% of all word list data). Typically, a word was mispronounced in the first of the four repetitions and then correctly pronounced in subsequent ones. These mispronounced words were discarded from the sample. Enough correctly pronounced words remained for each word class so that word list data could be used for all basilect-dominant speakers.
5. The database also includes measurements of f0 and F3.
6. The vowel distributions illustrated in Figure 3 contain normalized data presented in log Hz, a mathematically modified representation of the Hz scale, rather than raw Hz. This is done to facilitate cross-speaker comparison, as plot (A) provides data for a female speaker, while plots (B) and (C) plot data for males. Plotting raw Hz values for speakers with widely different fundamental frequencies (f0s) can obscure important similarities and differences between vowel distributions. For a discussion of the relation between log Hz and Hz, see Beckford Wassink (1999b).
7. Basilect-dominant speakers also show no temporal distinction for the pair /aɪ, ɔɪ/, which are merged in this variety.
8. The interested reader is directed to Patrick (1992) and Beckford Wassink (1999b) for a detailed society of the sociolinguistic markers (r) and (KYA).

REFERENCES

Agorsah, Kofi. (1994). Lecture given at the University of the West Indies, July.

Akers, G. (1981). *Phonological variation in the Jamaican continuum*. Ann Arbor, MI: Karoma.

Beckford Wassink, A. (1999a). Historic low prestige and seeds of change: Language attitudes toward Jamaican Creole. *Language in Society* 28:57–92.

Beckford Wassink, A. (1999b). *A sociophonetic analysis of Jamaican vowels*. Doctoral dissertation, University of Michigan, Ann Arbor.

Blom, J.-P., & Gumperz, J. J. (1972). Social meaning in linguistic structure: Code-switching in Norway. In J. J. Gumperz & D. Hymes (Eds.), *Directions in sociolinguistics: The ethnography of communication*. New York: Holt, Rinehart and Winston.

Cassidy, F. G. (1961). *Jamaican talk: Three hundred years of the English language in Jamaica*. London: Macmillan.

Cassidy, F. G., & Le Page, R. B. (1967). *Dictionary of Jamaican English*. Cambridge: Cambridge University Press. Reprinted 1980.

Christie, P. (1995). *Attitudes to Creole: Some Jamaican evidence*. Paper presented at the Society for Pidgin and Creole Languages, New Orleans, January.

DeCamp, D. (1961). Social and geographical factors in Jamaican dialects. In R. LePage (Ed.), *Creole language studies II*. London: Macmillan. 61–84.

DiPaolo, M., & Faber, A. (1990). Phonation differences and the phonetic content of the tense–lax contrast in Utah English. *Language Variation and Change* 2:155–204.

Disner, S. F. (1980). Evaluation of vowel normalization procedures. *Journal of the Acoustical Society of America* 69:253–261.
Fasold, R. (1990). *The sociolinguistics of language*. Oxford: Blackwell.
Hindle, D. (1978). Approaches to normalization in the study of natural speech. In D. Sankoff (Ed.), *Linguistic variation, models and methods*. New York: Academic. 161–171.
Hubbard, K. (1998). *Quantity or quality? Characteristics of typology of vowel length*. Paper presented at the Annual Meeting of the Linguistic Society of America, Chicago.
Irvine, A. (1994). Dialect variation in Jamaican English: A study of the phonology of social group marking. *English World-Wide* 15:55–78.
Labov, W. (1966). *The social stratification of English in New York City*. Washington, DC: Center for Applied Linguistics.
______ (1972). The logic of nonstandard English. In W. Labov (Ed.), *Language in the inner city: Studies in the Black English Vernacular*. Philadelphia: University of Pennsylvania Press. 201–240.
______ (1984). Field methods of the Project on Linguistic Change and Variation. In J. Baugh & J. Sherzer (Eds.), *Language in use*. Englewood Cliffs, NJ: Prentice-Hall.
Lalla, B., & D'Costa, J. (1990). *Language in exile: Three hundred years of Jamaican Creole*. Tuscaloosa: University of Alabama Press. 62–67.
Lawton, D. (1963). *Suprasegmental phenomena in Jamaican Creole*. Doctoral dissertation, Michigan State University, East Lansing.
Lehiste, I. (1970). *Suprasegmentals*. Cambridge, MA: MIT Press.
LePage, R. (1960). *Jamaican Creole: An historical introduction to Jamaican Creole*. London: Macmillan.
Mead, R. R. (1996). On the phonology and orthography of Jamaican Creole. *Journal of Pidgin and Creole Languages* 11:335–241.
Milroy, L. (1980). *Language and social networks*. Oxford: Blackwell.
Nearey, T. M. (1977). *Phonetic feature systems for vowels*. Doctoral dissertation, University of Connecticut, Storrs.
Patrick, P. L. (1992). *Linguistic variation in urban Jamaican Creole: A sociolinguistic study of Kingston, Jamaica*. Doctoral dissertation, University of Pennsylvania.
______ (1999). *Urban Jamaican Creole: Variation in the mesolect*. Amsterdam: Benjamins.
Sabino, R. (1996). A peak at death: Assessing continuity and change in an underdocumented language. *Language Variation and Change* 8:41–61.
Sebba, M. (1993). *London Jamaican*. London: Longman.
Veatch, T. C. (1991). *English vowels: Their surface phonology and phonetic implementation in vernacular dialects*. Doctoral dissertation, University of Pennsylvania, Philadelphia.
Wells, J. C. (1973). *Jamaican pronunciation in London*. Oxford: Blackwell.