CHANGE OVER TIME IN [ɛ] AND [æ] IN HAWAIʻI CREOLE

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ABSTRACT

The paper presents the first quantitative investigation of two vowels in Hawaiʻi Creole, [ɛ] and [æ] (referred to here as JRES and CHRAEP). While these vowels have been described both as distinct and overlapping in the literature, the present paper adds differentiated evidence of external and internal factors that bear on their realizations. Using a corpus of 32 speakers born between 1896 and 1988, 2,311 tokens of the target vowels are acoustically analyzed. Results indicate phonological effects, in particular, that pre-lateral JRESS is merged with CHRAEP. In addition, changes are observed over time; whereas older speakers show notable overlap between JRES and CHRAEP, this has waned over time due to the lowering and retraction of CHRAEP. Despite this change, speakers show synchronic variation within age group in JRES-CHREAP overlap. These findings bear on models of language change in Hawaiʻi including decreolization and the feature pool.

Keywords: language variation, vowel change, Hawaiʻi Creole, Pidgin, phonological conditioning.

1. INTRODUCTION

Hawaiʻi Creole (or Pidgin, as it is locally known; ISO 693-3 hwc) is an English-lexified creole spoken by ca. 700,000 people, the vast majority of whom reside on the Hawaiʻi archipelago [1]. As a plantation-based creole, Pidgin has its roots in colonialism. After initial European contact in 1778, the Kingdom of Hawaiʻi underwent rapid and sweeping social changes. Increased foreign presence, in particular by Christian missionaries in the 19th century, contributed to both the steady decline of *ʻōlelo Hawaiʻi* (the Hawaiian language) and the systematic disenfranchisement of the *Kānaka Maoli* (Hawaiian people) [2-3]. These changes were spurred on by the establishment of sugarcane plantations in 1835, which drew on a globally sourced labor force, including workers from Portugal, Japan, and Cantonese-speaking parts of China. Plantation workers initially used a Hawaiian-lexified pidgin (Pidgin Hawaiian; PH) as a means of communication; however, by the 1880s, a small, but increasingly powerful English-speaking minority dominated Hawaiian economic spheres, motivating the development of a new, English-lexified contact variety, Hawaiʻi Pidgin English (HPE), spoken especially widely in the urban center of Honolulu [4]. HPE gradually displaced PH on plantations, as English systematically replaced ʻōlelo Hawaiʻi, and by 1910, assisted by the US's illegal seizure of Hawaiʻi in 1896, HPE was the *lingua franca* of Hawaiʻi [4]. After approximately three generations (between 1920-1930), HPE had creolized into Pidgin (Hawaiʻi Creole), and was the dominant language of the majority of locally-born children in Hawaiʻi [4-5].

A noteworthy feature of Pidgin is the status of the front vowels [ɛ] and [æ], referred to here as JRES and CHRAEP (this convention is based on Wells' lexical sets [6], but uses Pidgin cite words for *dress* and *trap*, spelled in Odo orthography [7] to refer to vowel categories; compare [8-9]). Various analyses claim that Pidgin shows no distinction between JRES and CHRAEP, with both vowels converging on [æ̝], particularly in basilectal varieties [7], and in the presence of non-obstruents (e.g., /l, n/) [10]. By contrast, mesolectal Pidgin speakers are reported to be more likely to produce a distinction between the two vowels, paralleling their realizations in Hawaiʻi English (compare [8] and [11]). However, example sentences from other descriptions (e.g., [12]) imply phonemic contrast between JRES and CHRAEP in a way that does not map cleanly onto English categories.

While acoustic phonetic analysis has been conducted on the local dialect of English spoken in Hawaiʻi (see [11, 13]), most descriptions of Pidgin have either not undertaken a direct analysis of the vowel system [1, 12], or they have relied entirely on auditory accounts [7, 10]. Thus, little is known about the acoustic patterning of Pidgin vowels, how phonological constraints bear on their realizations, and whether (and, if so, how) JRES and CHRAEP have changed over time. This paper begins to fill these gaps by conducting acoustic analysis on real-time spontaneous speech from a stratified Pidgin corpus.

2. METHODS

2.1. Speech corpora and participants

Participants were drawn from two speech corpora housed on Kaipuleohone at the University of Hawaiʻi at Mānoa [14]: the Bickerton Collection [10], recorded in the 1970s, and the Influences and Variation in Hawaiʻi Creole English collection, recorded in the 2000s [15]. These corpora represent two independent samplings at 30-year intervals of the Pidgin-speaking community, with relatively older and younger speakers at each time point, allowing for real- and apparent-time comparisons (for more, see [16]). Given that the breadth of speaker birthdates (1896-1988) represents the entire life-span of Pidgin as a contact language, the corpora offer a thorough picture of how the language has changed over time.

A balanced number of speakers were drawn across relevant demographic categories: *corpus* (1970s v. 2000s), *relative age* (old v. young), and *speaker sex* (women v. men). All participants (n=32) were recorded with other Pidgin speakers and resided on Oʻahu, Hawaiʻi (the Big Island), Kauaʻi, or Maui. Regional differences in vowel realizations were tested for, but none arose (see [9]). Table 1 presents a breakdown of the participants across the aforementioned demographic categories.

Corpus	Age (YOB)	Women	Men
1970s	Old (1896-1922)	4	4
	Young (1927-1946)	4	4
2000s	Old (1947-1967)	4	4
	Young (1983-1988)	4	4

Table 1: Distribution of participants.

2.2. Data preparation

The sociolinguistic-style interviews analyzed here were transcribed in Transcriber [17], totaling some 11 hours, or 66,000 words of spontaneous speech. These data were force-aligned using LaBB-CAT [18] housed on the Sociolinguistics Server at the University of Hawaiʻi at Mānoa. Boundaries surrounding all target vowels were manually checked and, if necessary, hand-corrected in Praat [19]. Grammatical words and unstressed tokens were excluded from analysis; no more than five instances of any lexeme were extracted for analysis from any one speaker. Measurements of F1 and F2 were taken at the vowel midpoint, and outliers greater than three standard deviations were removed. The resulting measurements were normalized following [20] on the basis of the entire vowel space (n=11,191). This yielded a total of 1,158 tokens of JRES and 1,153 tokens of CHRAEP for analysis.

The data were analyzed graphically and with linear mixed-effects models in R [21]. Separate models were fit to normalized F1 and F2 of JRES and CHRAEP using *lme4* [22], with significance assessed via Kenward-Roger approximation with *sjPlot* [23] (following recommendations in [24]). These models initially included age group, speaker sex, and phonological context in a three-way interaction, which was simplified if this did not improve model fit (assessed by comparing AIC). Preceding segment did not improve model fit, and so investigations of phonological context are restricted to following environment; this includes pre-obstruent (JRES=641, CHRAEP=714), pre-nasal (JRES=343, CHRAEP=409), and pre-lateral tokens (JRES=174, CHRAEP=30). Given the effect of duration on formant behavior [25], all models include vowel duration as a fixed effect. Speaker and word were random intercepts. Age group was chosen over year of birth in order to capture non-linear relationships over time. Alpha was set at 0.05.

3. RESULTS

3.1. Global phonological effects

Effects of following phonological context are shown in Figure 1. In the aggregate, JRES and CHRAEP exhibit some overlap in pre-obstruent and pre-nasal positions. However, the vowels show completely overlapped distributions when followed by /l/. While pre-lateral CHRAEP could not be modeled due to low token numbers and uneven representation across age group, the effect is clear for JRES, which is significantly lower (β=0.65, t=5.87, p<0.001) and backer (β=-0.41, t=5.96, p<0.001) than JRES in pre-obstruent position. A comparison of pre-lateral JRES and CHRAEP in Figure 2 appears to confirm this effect; pre-lateral JRES exhibits clear overlap with CHRAEP, suggesting that the distinction between JRES and CHRAEP is neutralized in pre-lateral position.

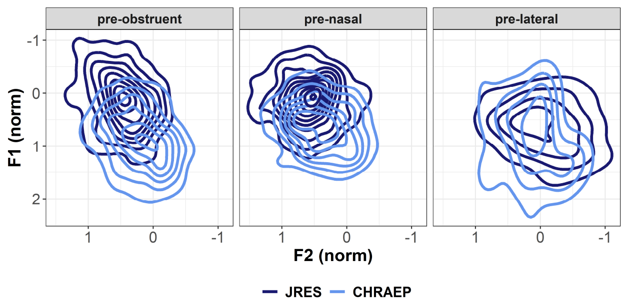

Figure 1: Two-dimensional kernel density plots of JRES (dark) and CHRAEP (light) across phonological context.

The two vowels show disparate effects when followed by a nasal. In JRES, a following nasal does not motivate significantly different realizations in either formant dimension (F1: β=-0.12, t=-1.31, p=0.192; F2: β=0.08, t=1.65, p=0.110). However, pre-nasal CHRAEP is significantly fronter (β=0.20, t=4.03, p<0.001) and numerically higher (β=-0.11, t=-1.90, p=0.058) than pre-obstruent CHRAEP. Of note, this effect in Pidgin does not motivate the extreme differences seen in the split-nasal system of some US varieties (where pre-nasal TRAP is raised and fronted; see [26]).

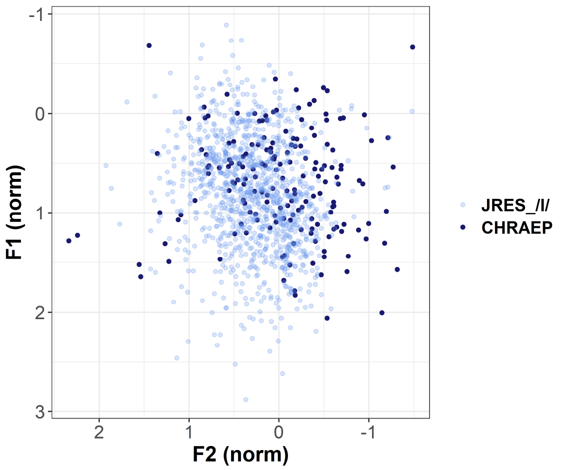

Figure 2: Scatterplot of pre-lateral JRES (dark) and CHRAEP (light); pre-lateral CHRAEP excluded.

3.2. Changes over time

Results indicate that the front vowel space has undergone significant reorganization over time, chiefly due to motion observed in CHRAEP (see Figure 3). In the oldest group (1970s old), CHRAEP and JRES show a large degree of spectral overlap, a relationship that persists into the 1970s young group. In the more recent corpus, both the 2000s old (β=0.34, t=3.03, p<0.01) and 2000s young (β=0.28, t=2.45, p<0.05) show significant lowering relative to the oldest cohort, with the 2000s young also showing significant retraction (β=-0.51, t=-3.38, p<0.01). By contrast, JRES is stable in F1 and F2 across age group.

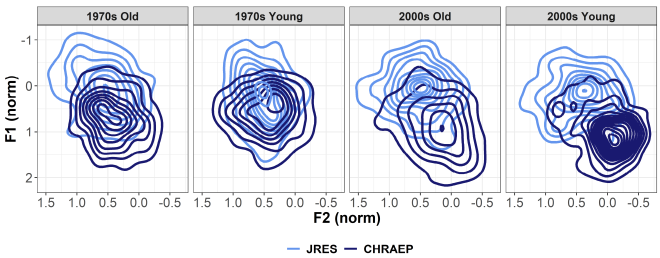

Figure 3: Two-dimensional kernel density plots of JRES (light) and CHRAEP (dark) over time; all pre-lateral tokens excluded.

The observed changes over time are mediated by phonological context. These effects are represented in the model estimates in Figure 4. While pre-lateral JRES generally remains lower than JRES in other contexts over age group, there is some variability by sex across age group. Both old 2000s men (β=-0.37, t=-2.12, p<0.05) and young 2000s women (β=-0.45, t=-2.54, p<0.05) show significantly raised pre-lateral JRES. This effect disappears for men in the subsequent generation, and pre-lateral JRES remains significantly backer and numerically (but not significantly) lower than pre-obstruent JRES for both old 2000s men (F1: β=0.16, t=1.02, p=0.562; F2: β=-0.66, t=-7.34, p<0.001) and young 2000s women (F1: β=0.20, t=1.38, p=0.354; F2: β=-0.45, t=-5.18, p<0.001). Given these differences, it is likely that the behavior seen in F1 for pre-lateral JRES points to variability in the sample rather than genuine change over time.

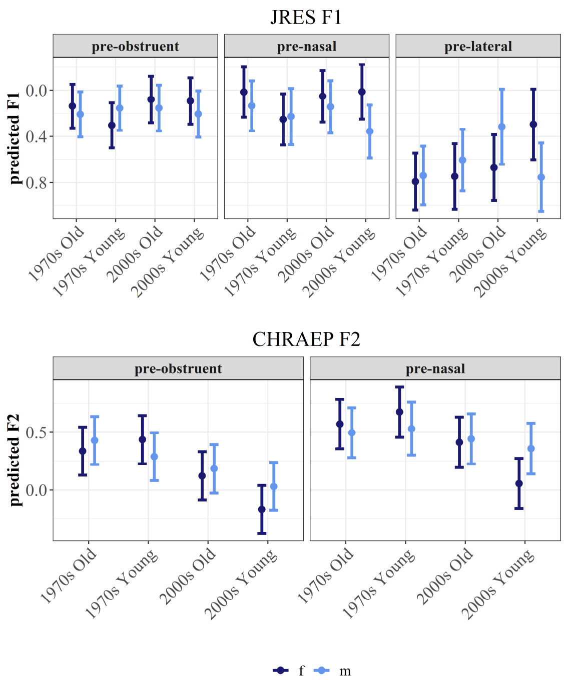

Figure 4: Predicted effects of phonological context and speaker sex (men=light; women=dark) by age.

Changes to CHRAEP over time are also mediated by phonological context and speaker sex. In particular, pre-nasal realizations of CHRAEP lag in their retraction over time, especially among men, an effect that is greatest in young 2000s men (β=-0.33, t=-5.02, p<0.001).

Together, these results suggest that older Pidgin speakers are more likely to exhibit a system where JRES and CHRAEP are overlapping, as described in [8]. Changes in speaker Pillai scores over time (a measure of vowel overlap; see [27]) support this observation (see Figure 5). Old 1970s speakers show a relatively tight grouping of scores (range: 0.03-0.22), which broadens somewhat in young 1970s speakers (range: 0.01-0.50). The old 2000s speakers show a relatively raised floor and ceiling (range: 0.12-0.62), a trend which continues into the young 2000s speakers (range: 0.18-0.70). Following the formula in [28] for calculating Pillai thresholds by sample size, only six speakers (all from the 1970s corpus) meet the criteria for a lack of distinction between JRES and CHRAEP (MrMonitz, Mrs Kodama, JA, George, GN, Allen).

Despite these trends, speakers clearly show variability in JRES-CHRAEP overlap in each corpus. Several speakers in the 1970s corpus (MrDias, NK, Kapeka, SA) show relatively high Pillai scores, suggesting that the two vowels are distinct. In fact, it is these speakers who motivate the apparent aggregate differences evident in Figure 3 in each 1970s age group. And while most 2000s speakers exhibit clearly distinct JRES-CHRAEP distributions, some (Bula, Darryl, Summer), show stronger evidence of overlap. This synchronic variation indicates that, far from being complete, JRES-CHRAEP overlap remains in flux in modern Pidgin speakers.

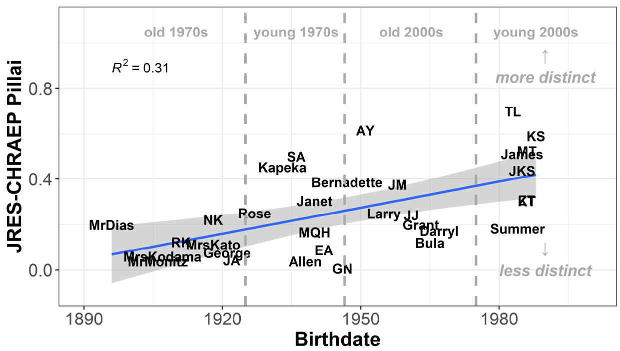

Figure 5: JRES-CHRAEP Pillai scores by birthdate with regression line; pre-lateral tokens excluded.

4. DISCUSSION

These results add considerable nuance to the phonetic relationship between JRES and CHRAEP, categories which the Pidgin literature has characterized as both distinct and overlapping. Results from this study demonstrate that CHRAEP has lowered and backed away from JRES over time, increasing the spectral distance between the two vowels. Evidence for JRES-CHRAEP overlap is found in Pidgin speakers recorded in the 1970s, while younger speakers are more likely to exhibit greater spectral distance between the two vowels. These changes over time are mediated by phonological context. For CHRAEP, a following nasal inhibits retraction (an effect that is clearest in young 2000s men), leading to a system where pre-nasal CHRAEP is somewhat more peripheral than pre-obstruent realizations (an effect that is nowhere near as extreme as the split-nasal system observed in some North American varieties; see [26]). In addition, pre-lateral JRES is considerably overlapped with CHRAEP, suggesting a contextual merger in Pidgin. This merger bears surface similarity to similar phenomena in Australia [29] and New Zealand [30], and is likely due to coarticulatory effects of the following /l/ rather than any direct contact between the varieties. Indeed, coda /l/ is velarized in Pidgin (or vocalized entirely; see [8-9]), which, in varieties of English, frequently motivates vowel retraction [6]. Importantly, the observed lowering and retraction does not generalize to other sonorant-adjacent contexts (compare [10]).

It is impossible to discuss the observed changes without also contending with the literature on decreolization. Though decreolization has chiefly been argued on the basis of morpho-syntactic variables, it has been the main explanatory model of change in Pidgin since the 1970s (see discussion in [31]). If, as [8] argues, JRES-CHRAEP overlap is a feature of basilectal Pidgin, then results from the present study would suggest that older speakers represent more basilectal varieties than younger speakers, and hence, be evidence for phonological decreolization (although the present study offers no operationalization of speakers' lectal status).

However, it is important to remember that English and Pidgin are two varieties that, in Hawai‘i, are synchronically linked, despite their distinct grammars and histories. Pidgin and English have always been in direct, localized contact with one another in Hawai‘i; the social hegemony established on the plantations (which reified English at the expense of Pidgin) continues to be reproduced today [3, 31], and many Pidgin speakers are bilingual in English [8]. In this way, decreolization fails to capture "the tensions inherent in post-colonial capitalist societies" [31]; instead, a model that draws on the importance of variables from both languages—the feature pool—is more appropriate to characterizing the socio-indexical landscape of Hawai‘i [32-33]. Drager et al. [13] use apparent time data to demonstrate that TRAP is retracting in Hawai‘i English without concomitant change in DRESS, similar to the pattern identified here for Pidgin. The authors argue that this asymmetry cuts against claims of a chain shift in Hawai‘i English (compare the Low-Back-Merger Shift [34]). They instead identify self-reported ability to speak Pidgin as an important axis of variation in these vowels. Young Hawai‘i English speakers who reported that they did *not* speak Pidgin exhibited lower TRAP onsets than those who reported that they *did* speak Pidgin, suggesting that English-Pidgin bilinguals showed more Pidgin-like TRAP realizations. Importantly, the Pidgin speakers considered in the present study show variability in the degree of JRES-CHRAEP overlap even in the youngest speakers, where CHRAEP retraction is greatest. This raises the possibility that the *extent* of JRES-CHRAEP overlap (or, whether a specific token is realized as either [ɛ] or [æ]) is a feature available for meaning making in Hawai‘i for speakers of both Pidgin and Hawai‘i English.

An investigation of the complex indexical meanings of JRES and CHRAEP is necessarily left to future work; however, the current study sets the groundwork by offering the first acoustic analysis of these vowels in Pidgin. Specifically, there is evidence (i) that pre-lateral JRES is merged with CHRAEP, and (ii) of a change in progress in Pidgin, whereby CHRAEP retraction away from JRES has increased the spectral differentiation between the two vowels.

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