

The California Vowel Shift in Santa Barbara

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Abstract The Northern California Vowel Shift was first noted by linguists in the late 1980s. The current study builds upon previous findings by investigating vowel systems in Santa Barbara. Using two reading passages, the vowel spaces of fifteen middle class, white, 20-30 year olds were examined at the midpoint of F1 and F2. The goal of this project was to determine whether the CVS is present and whether gender and other demographic variables are statistically significant. Quantitative analysis found that these speakers' vowel systems exhibit the characteristics of front and back vowels in the CVS. Women have a lower and more backed /ɛ/ realization than any other gender. Furthermore, women who stayed in California for college are more likely to have a complete split between pre- and non-pre-nasal /æ/ tokens. Men have /æ/ raised before /k/, which indicates that they may not have fully adopted the shift.

1 Introduction

1.1 Background

The Atlas of North American English (ANAE; Labov et al. 2006) recognizes three major dialect regions: the North, the South, and the West. This is based on the three patterns within American English vowel spaces: the Northern Cities Shift, the Southern Shift, and the Low-Back Merger (Labov 1991; Labov et al. 2006). In particular, these distinctions are determined by the location of the low-front and the low-back vowels within the vowel space. The West, or “Third Dialect region”, is characterized by having a single phoneme for /ɔ/ and /ɑ/ (Boberg 2005b). The low-back merger is not restricted to the West, but the distinctive features of other dialect regions are not found in the West. Therefore, the West is characterized by an absence of features that other regions exhibit.

The characterization of the West as a single dialect region downplays the linguistic variability within that region, most of which has been documented during the past decade since the ANAE appeared, vastly oversimplifies the vowel spaces of an incredibly large geographic region. For example, speakers in many areas of California participate in the California Vowel Shift (CVS), which has several distinctive elements. Eckert (2004) describes the CVS as follows:

- /ɪ/ fronting before nasals, backing and lowering elsewhere
- /ɛ/ backing and lowering
- /æ/ raising to /eɪ/ before nasals and lowering and backing elsewhere
- /ʌ ʊ u o/ fronting
- /ɑ/ and ɔ/ are completely merged and raising

In line with scholarship promoting the division of the “West” into smaller dialect regions (Hinton et al. 1987; Hall-Lew 2004; Aiello 2010; Kennedy & Grama 2012), I propose that California is not homogeneous with other Third Dialect regions and merits more exhaustive phonetic description. Santa Barbara was chosen as the location of this research due to its seat in the Central Coast of Southern California. The majority of linguistic research has taken place in either Northern California (Preston 1986; Hinton et al. 1987; Eckert 2004, 2008; Hall-Lew 2009, 2011; D’Onofrio et al. 2016) or the Los Angeles area (Bucholtz et al. 2007; Aiello 2010; Kennedy & Grama 2012). This leaves the more northern half of SoCal completely unexplored acoustically.

1.2 The Field Site

Historically multilingual and diverse, Santa Barbara county was settled by the Chumash tribe over 13,000 years ago (Tompkins 1976). The region was explored by Spaniards in 1542, though it wasn’t settled until 1782. It was ruled by Mexico between 1822-1846, and became a part of the United States in 1848 under the Treaty of Guadalupe Hidalgo (Baker 2003). The city currently spans 19.5 square miles of land, not including unincorporated areas or Goleta, CA. As of the 2010 United States Census, the population is 88,410. The estimated population as of 2015 is 91,842. Santa Barbara is unique due to its \$106 billion per year in tourism revenue. For its relatively small size, this means a huge amount of contact with people from all over the world. Therefore, it functions both as a melting pot and as a small town. Its location within the county and the state are highlighted in red in the map below in Figure 1. The racial breakdown from the census is provided in Figure 2. Hispanics and Latinx are considered to be White by race, though they are distinct by ethnicity. These populations were determined through a follow-up question in the census and make up 38% of the population. Non-Hispanic Whites were 52.2% (U.S. Census Bureau 2010).



Figure 1 Santa Barbara County

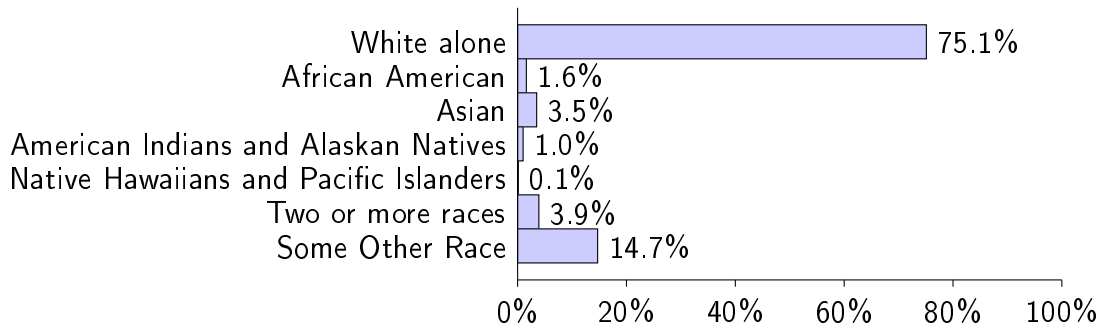


Figure 2 City of Santa Barbara 2010 U.S. Census

1.3 Vowels in the West

In Northern California, linguists have noted the presence of a vowel shift since the 1980s. [Reed & Metcalf’s \(1952\)](#) Linguistic Atlas of the Pacific Coast (LAPC) claimed that no phonological changes were observable in California that were specific to the area ([Hinton et al. 1987: 117](#)). By the 1980s, California English had become a stereotype through popular culture caricatures of surfers, hippies, and Hollywood, and was identifiable elsewhere in the nation ([Preston 1986: 229](#)). Based

on these media parodies in movies and novels, the following traits were evident: fronting of /ʊ/ and /u/, lowering of /ɪ/ and /ɛ/, and lowering and backing of /æ/. [Hinton et al.](#) compared the speech of native, young, middle-class Californians from the Bay Area to the transcriptions in the LAPC Survey (p. 118). Among speakers under the age of 30, back vowels are fronting over 70% of the time, compared to less than 30% among those born in the 1950s (p. 119). They also reported instances of /o/ fronting, which were not at all present in earlier records.

With regards to the front vowel shift, [Hinton et al.](#) found both lowering of front lax vowels, and also raising of front vowels before nasals and of /ɛ/ after velars (1987: 121). These same vowels are lowered and backed before /l/ and /ɹ/. The authors tie this to ethnicity and urbanity, as young middle-class Anglo urban Californians exhibit the most fronted back-vowels as well as the most lowered lax front vowels. Non-white speakers and rural speakers are more likely to have lax front-vowel raising before nasals (p. 123). The authors note that these particular elements are not exclusively Californian. [Labov](#) (1980) and [Eckert](#) (1986) report fronting of back vowels and lowering of /ɪ/ and /ɛ/ in Philadelphia and Detroit (p. 125). This is consistent with [Labov, Yaeger & Steiner](#)'s general principles of vowel shifts (1972):

- i. Lax vowels fall in chain shifts
- ii. Back vowels are fronted

Therefore, the behavior of the front lax vowels is not unique to California, but the California Vowel Shift as a whole differs from other known vowel shifts. [Eckert](#) named the systemic Western shift the “Northern California Vowel Shift” (CVS) in 2004. Based on her examination of Chicano and Anglo adolescents in Palo Alto, CA, she characterizes the shift as a counterclockwise rotation of front and low vowels (2008: 28). She argues that this shift is a part of a larger ethnolect that is used by youth to index both ethnicity and ‘norms of coolness’ (p. 41). In particular, there is a contrast between the Anglo raising of /æ/ before nasals and the complete lack of raising in Chicano English (p. 35). [Eckert](#) found that for both Anglo and Chicano elementary schools, girls exhibit greater stylistic activity in order to signal these differences and index social power (p. 36).

Linguists have traditionally credited the low-back vowel merger with starting front-vowel chain shifts ([Eckert 2004](#)). This argument has also been applied to the Canadian Shift ([Kennedy & Grama 2012](#): 50). It follows that as /ɑ/ retracts, /æ/ becomes more centralized, thus lowering /ɛ/ and /ɪ/. [Kennedy & Grama](#) argue that while this explains the Canadian Shift where the back-vowel merger is very retracted,

this is not evident in California (p. 51). They found a central position for this vowel, while /æ/ is still lowered and retracted. Therefore, for California speakers the chain shift cannot necessarily be a result of /a/ retraction as not all speakers underwent this. With no new room for /æ/ to retract into, it is therefore possible that the CVS comes from a push chain started by the lowering of /i/ (p. 51). These authors thus explain the shift by asserting that /i/ and /ε/ have finished moving in both men and women, but female speakers are ahead in the lowering of /æ/. They also offer that it's possible that /æ/ was the first to retract, or that the California and Canadian shifts are the same with California speakers reacting to a much smaller degree of /a/ retraction. Finally, another hypothesis is that the back-vowel merger did initiate the change but some California speakers adopted a hybrid system where the results of the merger are present but the raising is not (p. 52). All that is clear from these theories is that more documentation is necessary to truly understand the vowel shifts in the West.

Hall-Lew has done extensive sociophonetic research on the Third Dialect. This began in 2004 with her examination of the varieties of English in Arizona. In this analysis, each participant was given a FRONTING SCORE (p. 11) which indicates the amount that any given back vowel is fronted. An analysis of /oʊ/ and /u/ showed that young females have more fronted /oʊ/ tokens than any other age or gender category (p. 19). Fronting is also found within the community of older male 'ranchers', descendants of families who moved west from Oklahoma in the 1930s. This indicates the presence of two simultaneous dialects: those maintaining the frontedness of the Southern Vowel Shift and a change in progress as young urban women begin using the WESTERN SHIFT (p. 24). This indicates that the CVS was present in Arizona by the early 2000s. However, Hall-Lew reaffirms, both in this 2004 paper and in her subsequent 2005 paper using the same data set, that the fronting of these vowels does not prove the existence of a 'monolithic sound change that includes all speakers' (2005: 115).

In her dissertation, Hall-Lew examined the back vowels of Asian American and European American speakers in San Francisco, CA. She found that while younger speakers are moving towards a low back merger, there still exists some distinction when Traditional Sunset Natives assign value to it (2009: 106). She ties this maintenance with the preservation of European American norms within settlements on the East coast; that is, the low back vowel distinction is reminiscent of early settlers and has been passed down from historical ancestors. Asian Americans, on the other hand, entered San Francisco through new waves of migration and therefore orient themselves more towards newer, merged dialects (p. 159). This contradicts Labov et al.'s (2006) assertion that all white speakers in Third Dialect regions exhibit the low back vowel merger, as middle-aged and older white speakers

are maintaining the distinction in San Francisco. Hall-Lew followed up this research in 2011 with a study comparing age, gender, and ethnicity with regards to the CVS. She concludes that there is a change in apparent time across the entire community for /u/ fronting (p. 809). There were only trending correlations with gender and ethnicity. However, her body of work has focused exclusively on back vowels and does not examine the chain shift of front vowels in California.

Moving outside of Northern California, Bucholtz et al. (2007) provided the first account of perceptual dialectology within California in 2007. These authors had undergraduate linguistics students collect 703 perceptual maps and surveys of California speech patterns (p. 329). The state was most frequently divided into six geographic labels: Northern California, Bay Area, Central Coast, Inland, Los Angeles, and San Diego (p. 338). Despite more detailed geographic mapping, this study found strong ideological boundaries between Northern California and Southern California. The most salient differences were rooted in identity: ‘hippies’ vs. ‘surfers’ or ‘Valley Girls’ (p. 347) and slang: ‘hella’ vs ‘like’ or ‘the’ before freeway names (p. 345). This research offers valuable insight into the discrete social groupings of the state and their relationship to linguistic varieties (p. 348). That is, non-linguist natives of California consistently identify the state as having multiple separate dialect regions.

Focusing on the acoustic differences between the two regions, Aiello (2010) compared Northern and Southern California English speakers’ duration, pitch, jitter, and formant frequencies across the entire vowel space (p. 297). Using 21 young speakers and a word list (p. 298), they found no difference between the north and south regarding the phonetic realization of any vowels (p. 303). From this, they assert that the Northern California Vowel Shift has spread uniformly across the entire state. They also found no marked differences in pitch or jitter, but conclude that there is a duration difference by gender and region. Namely, Southern California men and Northern California women have a greater duration for both vowels and entire words (p. 310), suggesting that these regions express gender differently.

Most recently, a large amount of research on the CVS has been published in *Speech in the Western States* by the American Dialect Society. D’Onofrio et al. found regional variation between the northern Central Valley, the mid/southern Central Valley, and the coast with respect to the low vowel system (2016: 25). While /æ/ is firmly the lowest vowel in each system, the low back vowels seem to have merged before raising in the vowel space in the mid Central Valley, while northern speakers exhibit /a/ raising towards a merger with a stationary /ɔ/. They found significant sex differences for all three of these features; females lead in /æ/ retraction, /ɔ/ raising,

and merging of /ɔ/ and /ɑ/ (p. 26). This shows that while Californians may have identifiable accents, they are certainly not identical to each other.

In view of the variability across different areas of the West Coast, this study asks whether Santa Barbara differs linguistically from Northern California. For this study, the following research questions will be considered: Is Southern California exhibiting the CVS the same way that Northern California speakers are? How do male and female realizations of the CVS differ? How do non-binary and non-conforming speakers compare to those with binary-gender identities? How do level and location of education affect the CVS?

2 Methodology

2.1 Participants

The participant group for this study includes 15 white, 20-30-year-old, middle-class adults born and raised in Santa Barbara, California. The specific participants were chosen based on my personal network of friends and family in the area using a snowball recruitment strategy. Due to the short time span of this research project, the scope of research was carefully limited by as many social factors as possible. Therefore, the participants belong to one ethnicity, one socioeconomic class, one geographic region, and one age group. This leaves gender as the only social variable. These criteria are also necessary due to the small number of participants.

2.2 Experiment

The interview took place at a private location within the researcher's home in Santa Barbara. After getting comfortable, the participants were asked for consent and briefly informed about the general scope of the project and the process of the interview itself. The interview was conducted using a Marantz Professional Portable Flash Field Recorder (PMD661 Mk II) and an Audio-Technica 831b Lavolier Condenser Microphone. Two reading passages were used during these interviews: "Comma Gets a Cure" (McCullough et al. 2000) and "The Boy Who Cried Wolf" (Deterding 2006). After the interview, each participant filled out a post-interview questionnaire using Google Forms.

2.3 Demographics

Each speaker was coded for the following social factors taken from the post-interview questionnaire: gender, ethnicity, level of education, languages spoken, fre-

quency of non-English use, birth city, childhood city, high school, total number of years in Santa Barbara, and parents’ birth cities. Participants were also asked to list any significant amount of time spent away from Santa Barbara and include the location and how long they lived there. This includes any location where they spent more than six consecutive months. From this, I was able to determine whether the participant attended college inside or outside of California.

All participants responded with a childhood city of either Santa Barbara, CA or Goleta, CA. For the sake of this research, these cities are treated as the same response as they are separated by approximately 2.5 miles of unincorporated land and most residents travel between the two locations daily for school, work, commercial needs, etc. All participants identified as Caucasian/White. Speaker SB03 is the only participant who identified differently, marking both Caucasian/White and Latinx/Hispanic. The responses for gender, birth city, high school, and education level are provided below.

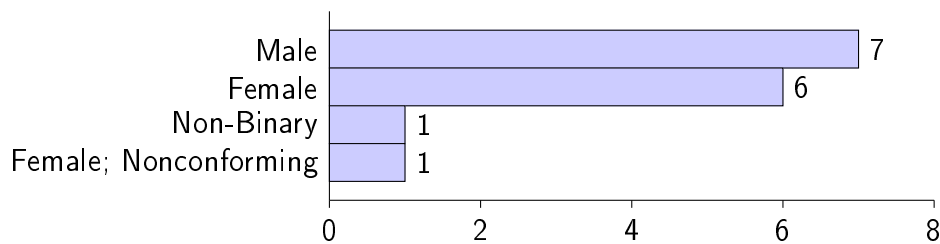


Figure 3 Gender Identity of Participants

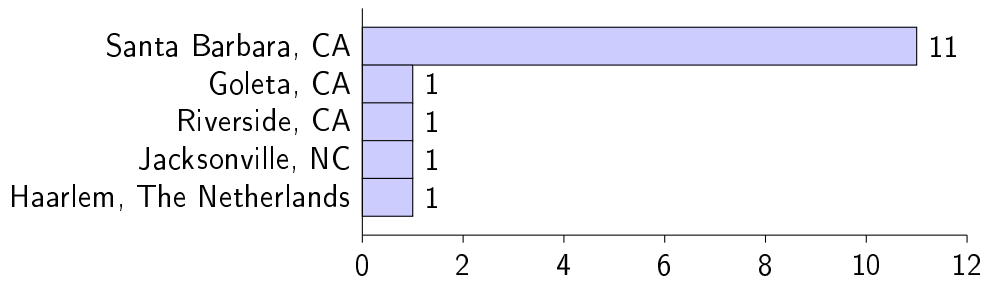


Figure 4 Birth City of Participants

2.4 Data Analysis

The WAV files of each reading passage were force aligned using the Penn Phonetics Lab Forced Aligner (Yuan & Liberman 2008). Each resulting TextGrid was hand

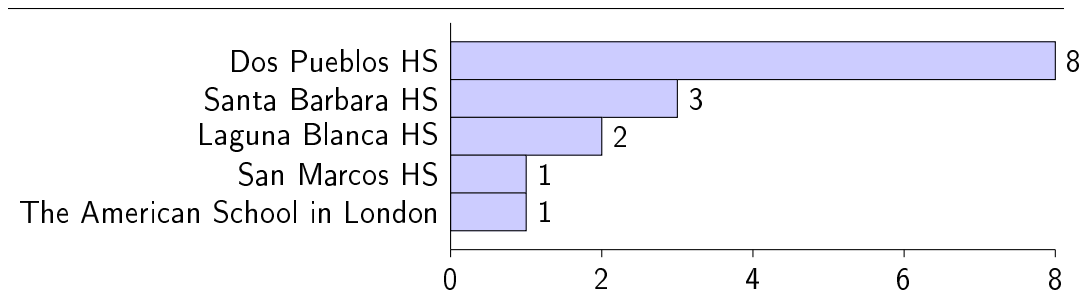


Figure 5 High School Attendance of Participants

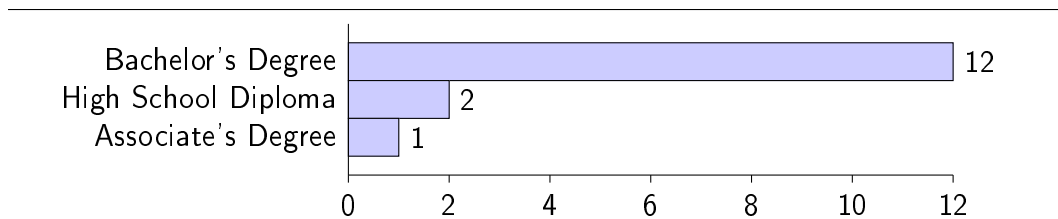


Figure 6 Education Level of Participants

corrected and tokens with overlapping speech or external sound interference were excluded from analysis. Using Praat 6.1.07 (Boersma & Weenink 2012), vowel formant data was extracted for the following phones: /i ɪ eɪ ε æ a ɔ u oʊ/.

Tokens were collected at five time points: onset, one quarter, midpoint, three quarters, and offset. A second phase of hand correction re-measured the formant values of tokens outside of 1.5 standard deviations away from the mean value for each phone. Other outliers were excluded from the dataset based on the following criteria: duration less than 50ms or the following phoneme was either an /l/ or /ɹ/. The remaining 1,997 tokens were then normalized using Lobanov normalization (Lobanov 1971). Tokens where the z2midpoint was less than -2.15 or the z1midpoint was greater than 2.15 were also excluded. In order to assess the effects of the social variables, multilevel regressions were carried out in the R statistical analysis software (R Core Team 2014).

3 Results

To address the first of my research questions regarding whether Southern California exhibits the CVS, I examined the vowel spaces of binary gendered participants from three corpora: my own Santa Barbara data, Northern California (Aiello 2010), and

Raleigh, North Carolina (Dodsworth 2014). I chose to compare the California data with Raleigh because I do not expect the young Raleigh speakers to be Third-Dialect shifted in the same way the young California speakers are. If both California corpora exhibit a contrast with Raleigh speakers, this would-be evidence that the Santa Barbara is California-Vowel shifted. In order to best combine the three data sets, I compared their un-normalized mean F1 and F2 values at the midpoint. The Raleigh data used is conversational data of 35 white speakers born after 1980. The Northern California data comes from word lists read by 10 speakers between the ages of 17 and 30 (Aiello 2010: 297). Unfortunately, this data set did not include following phoneme so no comparisons can be made regarding pre-nasal and non-pre-nasal /æ/. This is presented in Figure 7.

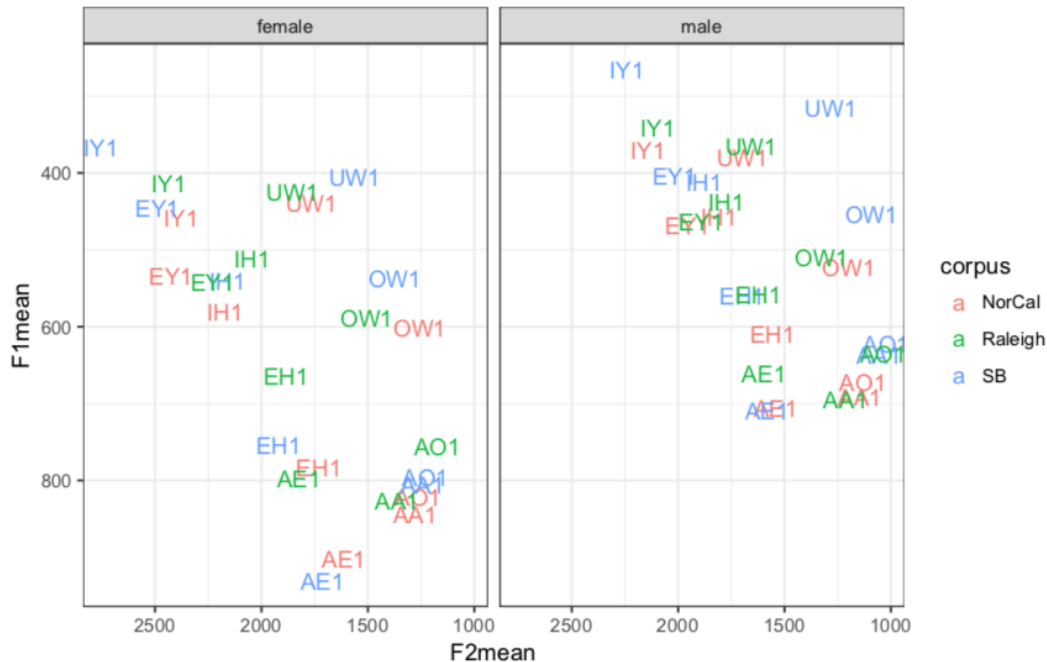


Figure 7 Vowel Plots of Three Cities

The phones are all labeled using Arpabet transcription in graphs due to the structure of the three corpora, but will be discussed using IPA transcription within this paper.

The most evident patterns appear with /æ/ and /ɛ/ in females: Northern California and Santa Barbara appear much lower than their Raleigh counterparts. For males, only /æ/ is lower than Raleigh in both California regions. The Santa Barbara /ɛ/ is

much higher than that in Northern California among males as well. Raleigh and Northern California both have more fronted /u/ than Santa Barbara among males. Finally, both California corpora show evidence of the low back merger, while Raleigh does not. The low back merger will not be examined in this paper, but will be more closely investigated in future research. There doesn't seem to be any significant difference in /ɪ/ between California and Raleigh, in contrast to the characterization of the CVS by [Eckert \(2004, 2008\)](#) and [Kennedy & Grama \(2012\)](#). Based on this data, females seem to be leading in the CVS, and both California corpora show strong evidence of shifting when compared to a non-Western region.

3.1 Gender

Next, I graphed the normalized Santa Barbara data by itself at the midpoint to examine the differences between the four gender identities of the participants. This is shown below in Figure 8. In keeping with the CVS as described by [Eckert \(2008\)](#), /æ/ tokens have been split into pre-nasal and non-pre-nasal. Nasal tokens are labeled AE1N and are only pre-/ɪ/ as none of the /æ/ tokens precede /m/ or /ŋ/.

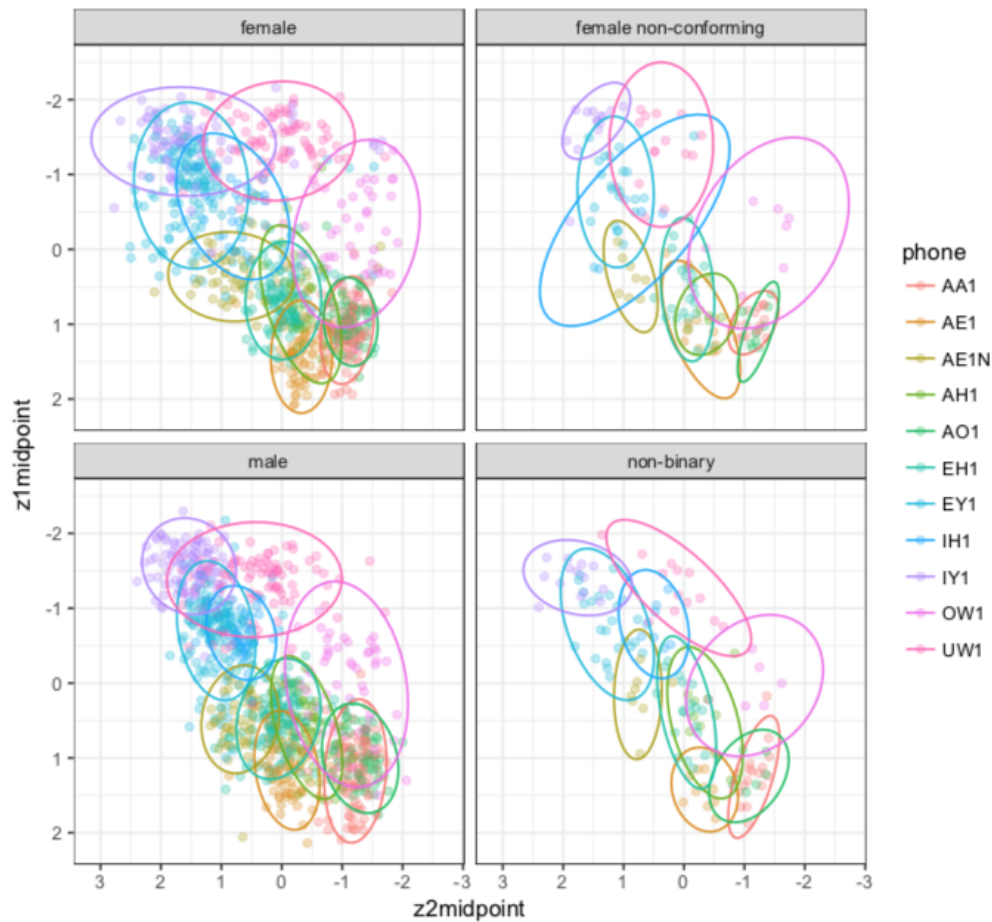


Figure 8 Santa Barbara Aggregate Vowel Plots by Gender

The effect of gender was evaluated using mixed-effects linear regression. For back vowels, the dependent variable was $z2_{\text{midpoint}}$ with sex as an independent variable and random intercepts for speaker and word. For front vowels, the dependent variable was $z2_{\text{midpoint}} - z1_{\text{midpoint}}$, which represents height and frontedness together. Each model was then compared with an intercept-only model to generate the probabilities reported in Table 2. In Table 1, the models with sex are named ‘phone a’ and the intercept-only models are named ‘phone b’. For the sake of studying the CVS affected phonemes, I have limited the regressions to /u oʊ ɪ ɛ æ/.

Based on these models, the only significant difference between any of the four genders regarding the realization of the CVS is with /ɛ/.

Variable	Df	AIC	BIC	logLik	Deviance	Chisq	Chi Df	Pr(>Chisq)
u a	7	370.5	393.93	-178.25	356.5	5.0548	3	0.1678
u b	4	369.55	382.94	-180.78	361.55			
oʊ a	7	64.768	83.412	-25.384	50.768	3.0888	3	0.3781
oʊ b	4	61.856	72.51	-26.928	53.856			
ɪ a	7	106.849	124.191	-46.425	92.849	0	3	1
ɪ b	4	103.23	113.14	-47.613	95.266			
ɛ a	7	330.75	356.68	-158.375	316.75	13.777	3	0.003226**
ɛ b	4	338.53	353.34	-165.26	330.53			
ae a	27	449.08	547.6	-197.54	395.08	0	19	1
ae b	9	242.19	275.03	-112.1	224.19			

Table 1

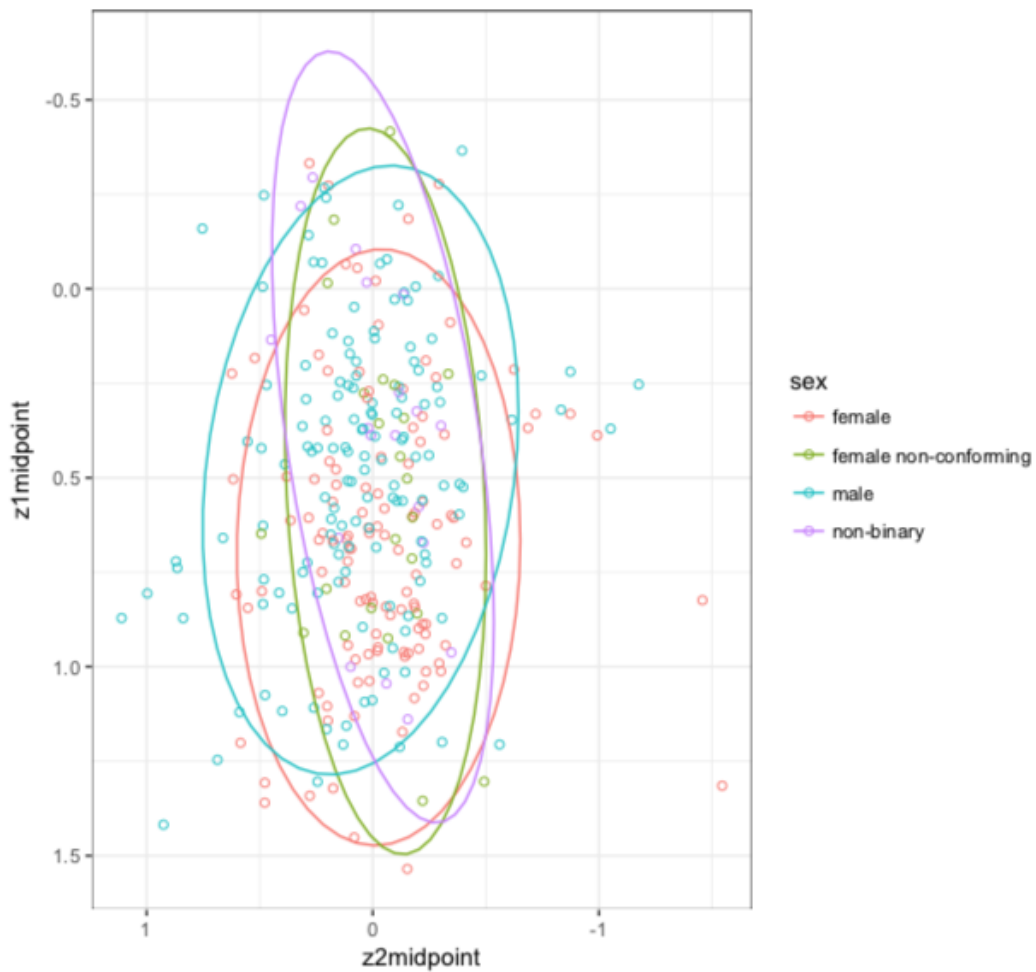


Figure 9 Vowel Plot of EH by Gender

Gender	Estimate	Std. Error	t value
Intercept	-0.63994	0.08641	-7.406
Female Non-Conforming	0.10766	0.13970	0.771
Male	0.29591	0.07393	4.002
Non-Binary	0.32999	0.14385	2.294

Table 2 Regression Results for EH

As we can see in both Figure 9 and Table 2, females exhibit a significantly lower and more backed realization of /ɛ/ than males and non-binary speakers. The female non-conforming speaker aligns with the female speakers. Looking at the means for each individual speaker for these vowels, there are no standout speakers or exceptional tokens that are skewing these results.

3.2 Education

Next, I evaluated the level of education as an independent variable. The results of these mixed-effects models are given in Table 3. As above, the models with education are named ‘phone a’ and the models without are named ‘phone b’

Variable	Df	AIC	BIC	logLik	Deviance	Chisq	Chi Df	Pr(>Chisq)
u a	6	371.89	391.97	-179.95	359.89	1.6603	2	0.436
u b	4	369.55	382.94	-180.78	361.55			
oʊ a	6	63.884	79.865	-25.942	51.884	1.9725	2	0.373
oʊ b	4	61.856	72.51	-26.928	53.856			
ɪ a	7	106.747	124.611	-47.373	94.747	0	2	1
ɪ b	4	4.316	14.225	1.842	-3.684			
ɛ a	7	342.44	364.66	-165.218	330.44	0.09	2	.956
ɛ b	4	338.53	353.34	-165.26	330.53			
ae a	21	479.2	555.82	-218.6	437.2	0	12	1
ae b	9	242.19	275.03	-112.1	224.19			

Table 3 Regression Results for Level of Education

This indicates that level of education makes no difference in this sample. This is consistent with the majority of the gender findings: that the speakers in this corpus are linguistically homogeneous. Another regression was completed for location of education. Speakers were divided into two groups: those that attended an undergraduate institution inside California, and those that went outside of California. As not all of the participants went to college, those that stayed in California during their would-be college years have been coded along with those that stayed in California for school.

This last regression examined a number of variables. The four models were as follows:

- i. The dependent variable alone, with random intercepts for speaker and word. This stays constant for the remaining three models
- ii. Independent variable: college location
- iii. Independent variable: sex
- iv. Independent variable: the interaction between college location and sex

For /æ/, these models were run with a further independent variable: the following phone. All other independent variables were examined in interaction with following phone. /ɛ/ continues to be significant in all models that include sex, which indicates that sex is the driving factor and adding college location does not significantly improve the model for this phone. The /ɪ/ model was a significantly better fit to the data with sex and college location interacting, but not enough to indicate a large difference between groups of speakers.

When examined in the interaction between college location and sex, males appear to be raising /æ/ before /k/ in addition to /n/, whereas females have distinct /æ/ distributions before /n/ and before /k/, respectively. This can be seen in Figure 10. Apart from males' raising of /æ/ before /k/, both males and females have lower /æ/ before non-nasal consonants than before /n/.

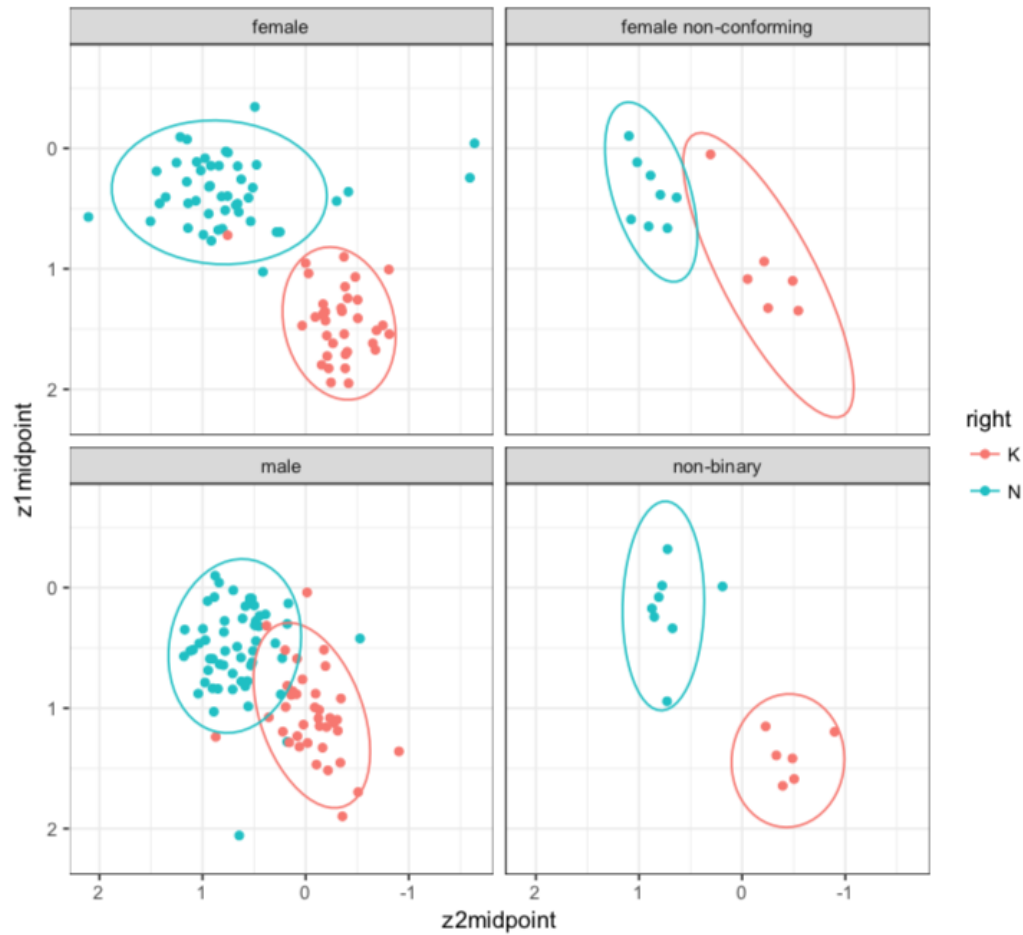


Figure 10 Vowel Plot of AE/AEN by Gender

Within this sample, two patterns of variation have emerged. First, women have a significantly lower and more backed / ϵ / than male and non-binary speakers. Second, men raise / æ / before / k / more than women. These findings are consistent with previous theories that women are leading the CVS. For at least these two phonemes, they are more shifted than their peers. If we assume that the chain shift is a pull shift led by the lowering and backing of / æ /, then it would make sense for female realizations of / ϵ / to be lower than their counterparts. If the remaining three genders of speakers have not finished lowering / æ /, then presumably / ϵ / would also not be in its final shifted location within the vowel space.

The pre-velar findings are similar to recent work examining the CVS. D'Onofrio et al. (2016) found that speakers in the northern Central Valley (Redding, CA) have fronted /æ/ before /g/. This could be linguistic identity marking, as this region associates very strongly with the Pacific North West (PNW) and a vibrant movement by the community to secede and join Oregon (p. 27). We also find this pre-velar /æ/ raising in Washington State. Wassink (2016) compares this to the /æ/ raising in the American Midwest (p. 79). Becker et al. (2016) found that older speakers in Portland have higher and fronted vowels before /g/ than /k/, but this feature seems to be receding (Fridland et al. 2016: 162). Cardoso et al. (2016) reported that San Francisco women raise /æ/ before /g/, but not nearly as much as pre-nasal raising (Fridland et al. (2016: 163). However, all of this research limits the investigation to the voiced velar. While pre-voiced-velar raising may be happening in Northern California as an identity marker associated with the Northwest, it has not spread to other areas of the state as of yet. There is no evidence of raising before the voiceless velar /k/. Therefore, I conclude that males raising before /k/ is not connected to the PNW accent. This pattern is most likely evidence that males do not have a fully realized split between pre-nasal and non-pre-nasal /æ/. This means that this sample of male speakers is not as advanced in the CVS as female speakers.

4 Conclusion

In answer to the initial research questions, I conclude that these young, middle-class, white Santa Barbara natives are California Shifted. This is consistent with previous findings in both Northern and Southern California. However, this shift has not been completed. Men have a significantly higher and more fronted /ɛ/, and haven't fully realized the split of pre-nasal /æ/ raising. While there are differences based on binary gender, we cannot make the same claims for non-binary or non-conforming speakers. There is also no significant difference in the CVS based on level or location of education. Future work should include more sociological variables such as social network and occupation in order to fully examine the CVS among these speakers.

The next step in this research is to force align and analyze the conversational interviews recorded with these speakers. This would allow me to make more general claims about the realization of the CVS across speech styles. Future data collection is required to increase the scope of this analysis. This would ideally include more speakers that identify as gender non-conforming and gender non-binary in order to truly test the phonetic similarities and differences between the four genders. Eventually I plan to expand this corpus to include multiple other demographic categories, such as non-white ethnicities and upper and lower classes.

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