Do I Talk Funny?: An acoustic analysis of Vancouver Island, Metro Vancouver, and Chicagoland English

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Abstract

This study examines the variable amounts of raising between urban and rural communities in British Columbia with the Chicagoland urban community. Through a close look at the distribution of /æ/, /aɪ/, and /aʊ/ raising in different phonetic contexts across all three geographic areas, we found differences between Canadian speakers as well as diversity between different communities in BC. Using acoustic analysis, we found /aɪ/ and /aʊ/ raising among speakers from the rural Vancouver Island group, while the Chicago and Metro Vancouver group exhibited significant raising of only /aʊ/. Regarding /æ/ raising, this appeared to be phonetically conditioned to raise before the velar nasal among speakers of all regions. While this phonetic context is important other factors appear to be at play given that raising before /g/ only occurred among Canadians, illuminating the need for further study of the /æ/ variable to examine whether it appears to be in stable variation or perhaps part of a larger change progress.

1 Introduction

This study focuses on variation in Canadian Raising in /aʊ/ and /aɪ/ before stops and fricatives and ash-raising through a dialectological approach comparing vowel height and backness between speakers from Metro Vancouver (MV), Vancouver Island (VI), and the greater Chicagoland area (CL). From anecdotal observation of our own speech patterns and those of our peers, we noticed differences between the extent of both Canadian Raising and ash-raising between VI and MV speakers where both phenomena appear more pronounced on VI. Based on previous research in the Atlas of North American English, we hypothesized that we would see /aɪ/ raising in all three locations, /aʊ/ raising in VI and MV to different extents but not in CL, and /æ/ raising before /ŋ/ in all regions, and before /g/ in VI and MV.

2 Regions and previous studies

Vancouver Island, separated from the west coast of mainland Canada by the Georgia Strait, is the second most populous island in the country with almost 900,000 inhabitants. It was briefly settled by Spain, established as a British colony in 1849, and joined with mainland BC in 1864 (Vancouver Island, 2020). Given VI's different settlement history it is unsurprising that Walter Avis' "The English Language in Canada *Current trends in linguistics*" (1973) highlights the uniqueness of the dialect found on Vancouver Island. He emphasizes that "there are, of course, regional variations to be found in Canada [...] for example, [...] on Vancouver Island" although he does not elaborate on what these variations are nor cite research on them. There is very little research about phonetic variation on VI, with most of it taking place in Victoria – the provincial capital and urban centre of the island. Rosenfelder (2005) found that a centralization of /aʊ/ existed in Victoria. Our study focuses on rural areas, with the majority of participants coming from the Cowichan Valley, which we anticipate will conserve variants not found in urban centres.

Metro Vancouver is the third largest metropolitan area in Canada, and the largest in BC with a population of almost 2.5 million occupying the southwest corner of mainland British Columbia. While some consider Canadian English to be relatively homogeneous, the dialect spoken here has some unique features. According to the *Atlas of North American English*, Vancouver English speakers don't tend to have raising in the MOUTH vowel (/aʊ/) or before voiceless consonants like many of their inland Canadian peers but do have raising in the PRICE vowel, /aɪ/. With regards to the /æ/ vowel, Canada as a whole has significantly less fronting

before nasals than dialects from the states. Additionally, British Columbians have a merger of /eɪ/ and /æ/ before /g/ (Labov, Ash, and Boberg 2006).

Chicago, a beautiful metropolis on the southern shores of the great Lake Michigan, is a part of the Inland North region and the metropolitan area is home to approximately 9.5 million speakers. While this regional dialect was historically the basis for a supposed standard "General American" dialect, the distinctive features of the Northern Cities Shift (NCS) documented in 1969 by Fasold means that this dialect is not unmarked (Labov et. al 2006:190). According to the *Atlas of North American English*, raising and fronting of the BATH vowel /æ/ is a large part of the NCS, which CL takes part in. However, according to the Atlas, the characteristic raising and fronting of /æ/ is diminishing in apparent time (Labov et. al 2006:192). Since the CL speakers in this study are predominantly young adults, the difference here between American speakers and their Northern peers may not be as large as it once was. Also of note is that our CL speakers are all Jewish, which could explain unexpected phonological differences. For example, non-raised pre-nasal /æ/ is typical of many Jewish people, especially Orthodox Jews (Benor 2018), although among the general population, raising is typically the greatest pre-nasal.

Regarding the PRICE vowel /aɪ/, Canadian linguist J. K. Chambers (1973, 1989) reported instances of the Canadian raising phenomena before voiceless consonants in the United States, although raising is not connected with the movement in the vowel space that occurs with elements of the NCS. While Canadians tend to raise /aɪ/ selectively before some vowels, /aɪ/ raising tends to be more general in the northern U.S (Chambers 2006). In terms of /aʊ/ raising in CL, we did not anticipate any raising and did not find historical evidence to suggest it in the area.

Chambers wrote in 1980 that "as fronted vowels become more frequent during the progress of the change in succeeding generations, we can expect that failure to raise the onset before a voiceless consonant will also become more frequent," predicting a possible disappearance of Canadian raising. Further, Chambers (1981) predicts that the tendency towards /aʊ/ fronting "will thus establish the onset vowel of the diphthong for the youngest group as normally central."

3 Method

There are three main portions to the data gathering process of this study. The first part being data collection through a Google Form, the second being formant analysis through the use of the linguistic analysis software Praat, and the third being the normalization of collected formant values. To collect data, we invited 21 speakers from Vancouver Island, 19 speakers from Metro Vancouver, and 20 speakers from the greater Chicagoland area to complete the form. All of our speakers were either adult Gen Z (1998-2004) or Gen X (1965-1980), with the vast majority coming from Gen Z. We asked participants for their year of birth, sex, the region they had grown up in from ages 5-15, current place of residence, and level of education. We then provided a word list of anchor vowels and twelve sentences targeting the MOUTH, PRICE, and BATH vowels, and participants had the ability to upload an audio sample[1].

. Although not all of our participants are from the same social class and ethnic groups, our speakers tended to be educated, and middle or upper middle class. The audio samples we gathered align relatively closely with a prestige dialect of North American English, which is likely a reflection of the speakers' sociolinguistic identity and compounded by the fact that the word and sentence list format we used tends to elicit careful speech. In fact, several participants asked if they had pronounced the words "correctly" and if they "talk funny," suggesting that some participants have style-shifted to align with an idealized and unmarked standard North American English.

To analyze data, we uploaded our participants' recordings into Praat. In Praat, we measured the first (F1) and second (F2) formants of each participant's anchor vowels as well as the F1 and F2 of the nucleus of their MOUTH, PRICE, and BATH vowels. To normalize our data, we used Neary's Constant Log Interval Hypothesis which involved two steps. We calculated a scaling factor for each speaker using the F1 and F2 values from the anchoring vowels. Then, we multiplied the F1 and F2 values of our targeted MOUTH, PRICE,

[1] See appendix A for full reading list of anchor vowels as well as sentences targeting the MOUTH, PRICE, and BATH vowels

and BATH vowels by the scaling factor in order to most accurately compare speakers and minimize the effects of biological differences such as vocal tract length. All numerical values presented in this paper are normalized according to this method.

As this study looks at raising and fronting, we decided to define raising as a difference greater than 60 Hz between the F1 values for vowels that occur before voiced codas and the
F1 values that occur before voiceless codas and fronting as a difference of 60 Hz between the F2 values when looking at average differences. An average difference near 60 Hz suggests that raising is present in some of the population and not others.

4 Results and discussion

The minimal set "back", "bag" and "bang" targets the realization of the /æ/ vowel before voiced, voiceless, and nasal velar consonants. "Beg" was included as a comparison based on observations that there could be a merger in VI English between /ɛg/ and /æg/. The following graphs plot each speaker's F1 and F2 values for the centre of each vowel.

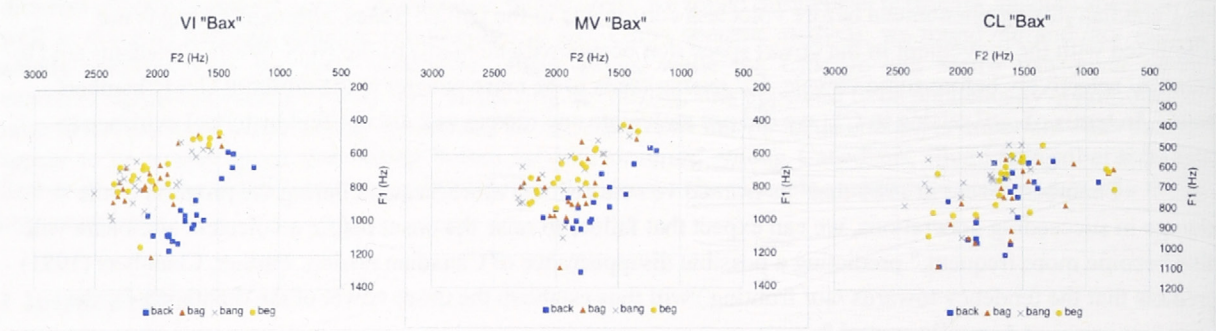

FIGURE 1

In Fig. 1 for VI, the vowels in "beg," "bang," and "bag" are in a similar distribution ("bang" being slightly more fronted and less raised), while the area of distribution for "back" overlaps with none of them. In MV "beg" and "bang" are in nearly the same distribution and while "bag" covers the same area there is a concentration of "bag" values toward the lower centre of the distribution cloud. "Back" more closely overlaps with the others in MV than VI. CL shows much broader overlapping variation for all four tokens, though there is a trend for "bang" to be higher and more fronted, and for "beg" to be higher than both "back" and "bag" which are very similar.

This is supported in Fig. 2 below, comparing the average vowel quality by region. "Back" is very low and both "bag" and "beg" are very fronted in VI and MV compared to CL
(VI more so than MV).

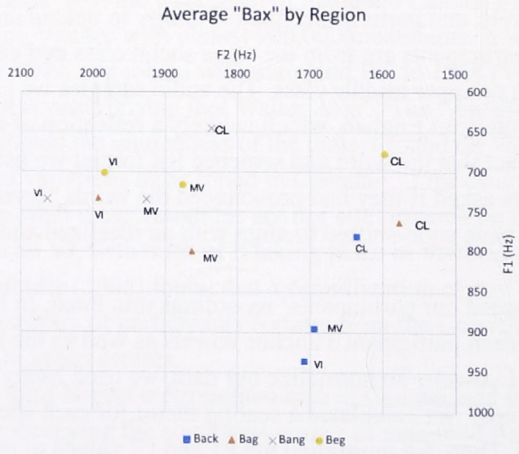

FIGURE 2

Table 1 below compares the average F1 and F2 value differences by region.

Region	Bag F1-BackF1 (Hz)	Bag F2-BackF2 (Hz)	Bang F1-BackF1 (Hz)	BangF2-Back F2 (Hz)	Bag F1-BegF1 (Hz)	Bag F2-BegF2 (Hz)
CL	-17	-58	-135	201	86	-19
VI	-202	284	-201	356	31	7
MV	-97	169	-161	232	82	-12

Table 1

This shows that "bag" is generally not raised for CL English speakers, and is close to the benchmark where it is considered retracted. It is raised and fronted in both VI and MV, although significantly more amongst VI speakers. "Bang" is raised and fronted in all three regions although the fronting is significantly more pronounced for VI. We found "beg" and "bag" to be very similar for VI – within the range of variation we saw between a given speaker's anchoring vowel tokens. It is interesting to note that the difference values for CL and MV are remarkably similar, perhaps reflecting the fact that both areas are larger urban centres and the speakers we analyzed there may be trending towards the adoption of a similar urban standard.

The minimal pairs "lice" and "lies" as well as "height" and "hide" are differentiated through a voicing contrast between the alveolar obstruents in their coda positions, with the former pair ending in a fricative and the latter in a plosive. These pairs both target the PRICE vowel. We examined the nucleus of the diphthong to measure the amount of raising that occurred when the coda was voiceless. Figure 3 illustrates that all three regions have significant amounts of vowel raising prior to voiceless stops when compared with voiced stops.

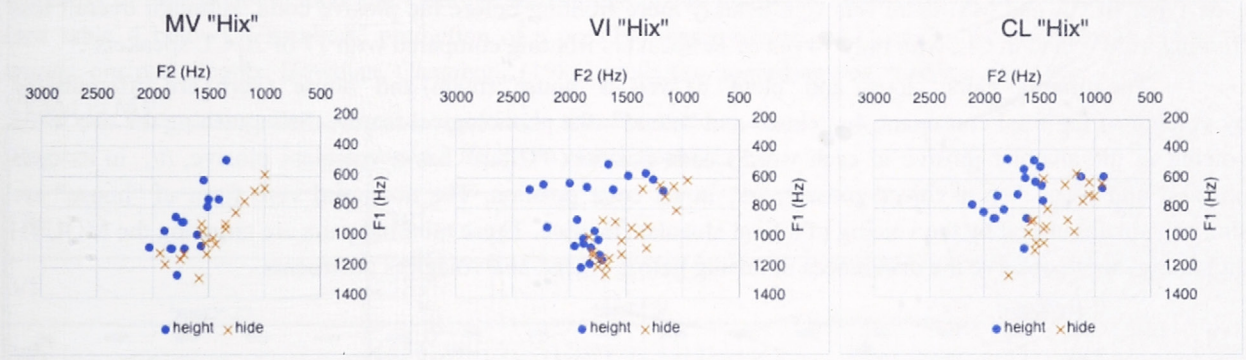

FIGURE 3

While there is still significant amounts of vowel raising prior to voiceless fricatives when compared with voiced fricatives, the manner of articulation in the coda appears to change the amount of raising and fronting, as seen in the graphs below.

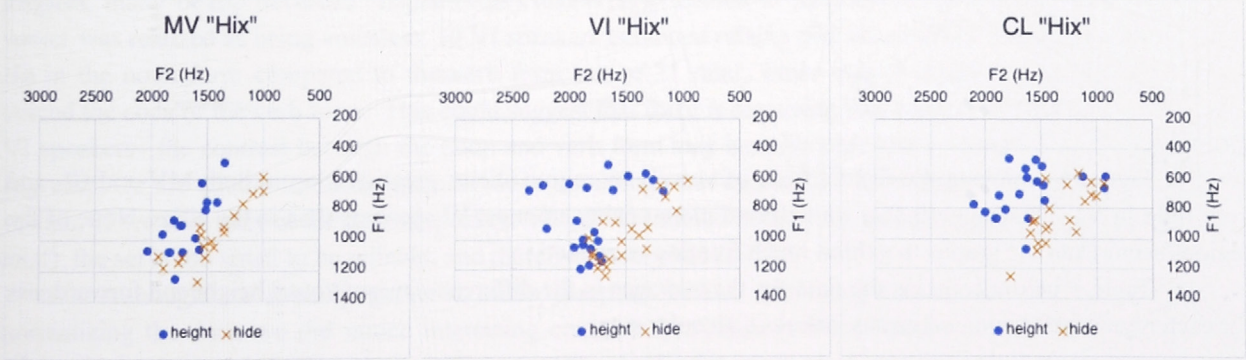

FIGURE 4

Table 2 below illustrates the average differences in height and backness between the vowels before voiceless vs voiced consonants. A larger absolute difference in F1 implies more raising or lowering, whereas a larger absolute difference in F2 implies more fronting or retracting. The most raising, illustrated by the greatest average decrease in F1 before plosives, was found in CL, although CL's raising was only marginally greater before the fricatives in the "lies" / "lice" minimal pair. CL and MV registered almost identical values. In accordance with the *Atlas'* definition of raising as a difference greater than 60 Hz, the average difference among VI speakers suggests a lack of raising or minimal raising before fricative codas, although they do raise before plosives. Among our participants, Canadian raising was actually greatest among the Americans, with 15 out of 20 CL speakers compared with 11 out of 19 and 9 out of 21 speakers from MV and VI respectively, illustrating that Canadian raising is not unique to the states' northern neighbours.

Region	Height F1 - Hide F1 (Hz)	Height F2 - Hide F2 (Hz)	Lice F1 - Lies F1 (Hz)	Lice F2 - Lies F2 (Hz)
CL	-142	259	-110	97
VI	-95	307	-52	301
MV	-62	190	-110	93

Table 2

Speakers from all three regions fronted their vowels before the voiceless coda; however, the amount of fronting was greater before the plosive coda than the fricative coda. For both coda types, the average difference was greatest on VI, where 18 out of 21 speakers fronted and there was a similar amount of fronting regardless of coda type. In CL and MV, there was significantly more fronting before the plosive coda, although overall less fronting in MV than in CL, with only 14 out of 19 speakers fronting compared with 17 of 20 CL speakers[2].

The minimal pairs "cloud" and "clout" as well as "house" (noun) and "house" (verb) are differentiated by voicing of the final consonant. In "clout" and "cloud" the phonological feature distinguishing the two is the voicing in the alveolar plosive in each word's coda position. "Clout" has a voiceless plosive, /t/, in its coda position and cloud has a voiced plosive, /d/, in its coda position. The noun and verb form of "house" are similarly distinguished by the voicing of a final alveolar fricative. These minimal pairs are targeting the MOUTH diphthong /aʊ/ to observe the differences in raising before voiced and voiceless obstruents.

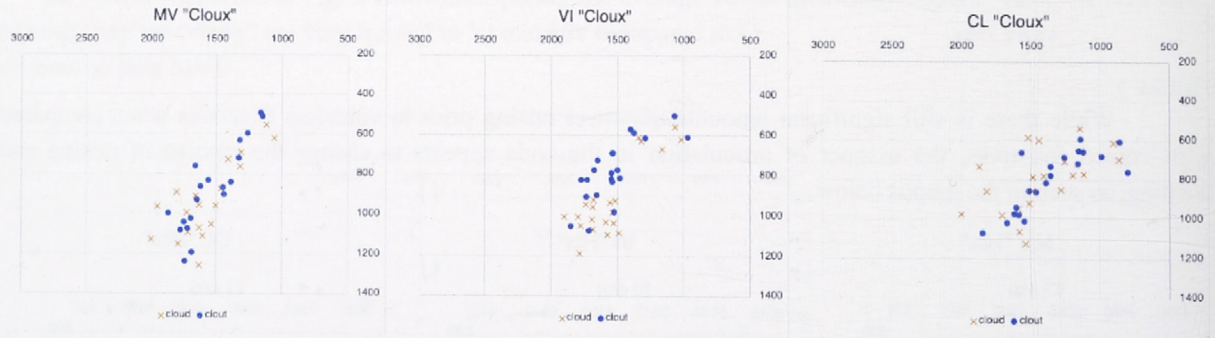

FIGURE 5

Figure 5, showing the distributions of vowels by region shows great overlap in both MV and CL and very little in VI. This suggests that we will find more raising amongst VI speakers than in the cities. None of the regions seem from the graphs to exhibit much fronting or retraction.

Table 3 below contains the data for the averages in the difference in /aʊ/ vowel height and forwardness for each region before voiced versus voiceless alveolar stops.

2 See Appendix B for table on the number of speakers who raised by region

Region	Clout F1-Cloud F1 (Hz)	Clout F2-Cloud F2 (Hz)
MV	-60	-37
VI	-142	-20
CL	-2	-90

Table 3

MV English speakers appear to have a preference towards raising the /aʊ/ diphthong before voiceless obstruents. Canadian raising for /aʊ/ then seems to be present in today's MV English speakers, although significantly less pronounced than on VI. As well, only 8 of our 19 MV English participants raised the /aʊ/ in clout so this phenomenon may be limited to few speakers. This is a change from what was observed in the *Atlas of Canadian English* which didn't find Canadian raising to be present in /aʊ/ in MV. This may be indicating a shift towards Canadian raising among young people, but could also have to do with many of our young MV speakers having parents from elsewhere in Canada who may have influenced the amount of raising speakers use. On VI there is much more /aʊ/ raising that there is in MV or CL, which is in line with predictions we made based on anecdotal evidence at the beginning of this paper. This is also in line with the acoustic analysis of Victoria done by Rosenfielder in 2005 who found that "despite the various studies predicting the decline and eventual disappearance of Canadian Raising,... it is still very much alive in Victoria some twenty years later." CL had virtually no raising, which follows from data from the *Atlas of Canadian English* and predictions based on anecdotal evidence.

Fronting or retraction of /aʊ/ between "cloud" and "clout" does not seem to appear in either MV or VI although there does appear to be a tendency to retract before the voiceless obstruent in CL. However, the frontness of /aʊ/ in both cloud and clout are on average higher and more centralised in MV and VI than in CL (see table 4 below). Chambers' prediction of a possible disappearance of Canadian raising has not occurred among our participants. However, Chambers' (1981) prediction regarding /aʊ/ fronting, does appear normal on VI and in MV.

Region	/aʊ/ F2 means in cloud/clout (Hz)
CL	1391
VI	1533
MV	1551

Table 4

In our audio files, we noticed a tendency not to voice the final /z/ in the verb form of "house." Although it is possible this is simply a reading error since we did choose a minimal pair that happened to be homonyms in English, many of the devoiced "house"(verb) tokens still seemed to have Canadian raising although the final vowel was realized as being voiceless. 13 VI speakers exhibited raising and 12 exhibited fronting greater than 60 Hz in the noun form compared to the verb form out of 21 total, while only 9 of the VI participants audibly voiced the coda of the verb form. This could suggest that there is devoicing that occurs after the raising for some VI speakers– the contrast between the noun and verb form may have become just a contrast in vowel quality. In any case, we are unable to differentiate between a reading error causing the devoicing or this being an emergent variant. If we look only at the data of speakers who differentiated in the coda position (approximately half of our total), the set is too small to be reliable, and therefore inconclusive.

Although we initially gathered audio samples for our anchoring vowels for the sole purpose of normalizing the data, we did notice interesting contrasts between our three speaker groups worth discussing. While the back vowels LOT and GOOSE were quite similar for speakers in all of our regions, there were quite significant differences in the front vowels BATH and FLEECE, as shown below.

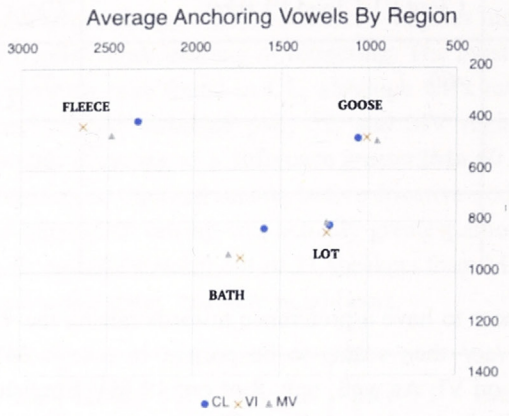

FIGURE 6

One reason may be that in CL, some speakers articulated the BATH vowels as a diphthong, whereas speakers from MV and VI did not. In terms of the LOT vowel, we measured this using the terms "caught," "stop," and "talk." These vowels are pronounced alike by the majority of the MV and VI speakers, although they are typically pronounced differently by CL speakers, who pronounce "caught" and "talk" with the same vowel /ɔ/ but "stop" with a different vowel /ɑ/. This is reflected in the lack of the caught-cot merger among these midwestern speakers.

5 Conclusion

As we recorded formant data in Praat, it was interesting to see the amount of change in F1 and F2 within vowels, and we imagine that further research looking at both the nucleus and the glides of diphthongs could illuminate even greater differences between CL speakers and their MV and VI peers.

Another noteworthy area for further study would be the devoicing of /z/ in "house" when used as a verb. Many of the speakers who devoiced the final consonant still raised the vowel in "house" the verb but not "house" the noun, leading us to believe that this could be more than a simple reading error.

Also, the extent to which "bag" and "beg" are distinguishable in VI English can be further studied. Over the course of the data collection process the researchers who do not have the bag-beg merger learned to o reliably identify which word was which when played in isolation, suggesting that the vowels are in some way distinguishable, despite having nearly identical height and backness measures. Perhaps this distinguishing factor could potentially be a variable such as vowel length which we did not examine.

In general, this study illuminates the diversity of Canadian English. Not only is it distinct from American dialects, but it is also unique within the province of British Columbia. Our initial hypothesis that /aɪ/ raising and /æ/ raising before /ŋ/ would occur in all regions was in line with the data we collected, as was our hypothesis that /æ/ would raise before /g/ in VI and MV but not CL. We saw fronting and retraction in all vowels we looked at, which we had not specifically predicted. We also correctly hypothesized that /aʊ/ raising would not occur among speakers from CL; however, we were incorrect in our assumption that it would occur in both VI and MV. In actuality, there was only significant raising among Islanders.

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Appendix A

Word/Sentence Lists Anchor Vowels:

See, Feet, Keep, Sat, Gap, Had, Pool, Fool, Rule, Stop, Caught, Talk

Sentences containing minimal pairs.

1. She has a lot of **clout.**
2. There is nowhere to **hide.**
3. They live in a **house.**
4. The child has **lice.**
5. The building reaches an impressive **height.**
6. He lost his **bag.**
7. Look at that **cloud.**
8. We have to come **back.**
9. They were difficult to **house.**
10. The dog will start to **beg.**
11. I'm sick of your **lies.** 12. I heard a loud **bang.**

Appendix B

House(n) (includes unvoiced House (n))

Region	Raised	Lowered	Retracted	Fronted
CL	6/20	2/20	10/20	6/20
VI	12/21	2/21	13/21	3/21
MV	9/19	2/19	5/19	4/19

Clout

Region	Raised	Lowered	Retracted	Fronted
CL	4/20	5/20	10/20	4/20
VI	16/21	1/21	7/21	4/21
MV	8/19	2/19	8/19	2/19

Lice

Region	Raised	Lowered	Retracted	Fronted
CL	9/20	1/20	5/20 10/20	
VI	9/21	2/21	1/21 17/21	
MV	12/19	0/19	5/19 11/19	

Height

Region	Raised	Lowered	Retracted	Fronted
CL	15/20	0/20	2/20 17/20	
VI	11/21	1/21	1/21 18/21	
MV	9/19	1/19	1/19 14/19	