OPEN VOWEL BACKING IN CANADIAN ENGLISH

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ABSTRACT

In Canadian English in Vancouver, the open front vowel /æ/ is acquiring a more retracted quality, beginning with groups with the highest social status, and about one generation earlier for women than for men. The open back vowel /ɑ/ also shows a progression in younger age groups to a preference for a more rounded or retracted [ɒ] variant among men, with women having a slightly higher incidence of [ɒ] vowels in all generations.

INTRODUCTION

Canadian English has ten primarily monophthongal vowels, /i, ɪ, e, ɛ, æ, ɑ, ʌ, o, ʊ, u/, of which [eⁱ, oᵘ, ⁱu] exhibit the most gliding; three diphthongs, /aɪ, aʊ, ɔɪ/, of which the first two have raised allophones [əɪ, əʊ]; and a distinct /ɚ/ with [ɪ, ɛ, a, ɔ, ʊ] also occurring as allophones of the basic set before /r/ [1]. The system's distinguishing characteristic lies in the merger of the two open back vowels /ɔ/ and /ɑ/, which neutralizes oppositions present in other varieties of English, so that 'caught' and 'cot' are homophonous and 'father' and 'bother' also rhyme. The merger is also found in some dialects of American English from New England to the Ohio River [2, 3], and is the likely result of early Scotch-Irish immigration patterns spreading to the southwest as well as north into Canada.

The open front vowel /æ/ functions as in most varieties of English. While American English varieties tend to raise the phonetic quality of /æ/ to [eə], [eə], or even as high as [ie] in some instances, Canadian English is not reported to participate in that kind of change [3].

Data are drawn from the Survey of Vancouver English, including 240 randomly-selected male and female English speakers native to the region, in three age groups: over 60, 35-60 and 16-34; and four socioeconomic status (SES) categories: middle and upper working class (MWC/UWC), and lower and middle middle class (LMC/MMC) [4].

The findings reported here include auditory evaluations performed for each token of /æ/ and of /ɑ/ for each speaker in the survey, drawn from the survey's reading passage (a conversational narrative with local content) to make the comparison uniform; and consisting of about 50 tokens of each vowel in stressed position for each social/age grouping. Acoustic analysis of these vowels, excluding diphthongs and /ɚ/, began as a sociolinguistic study of long-term voice quality settings [5, 6].

AUDITORY ANALYSIS

Variations in the realization of the open back vowel are grouped into two variants, [ɑ] and [ɒ], unrounded and rounded. The rounded allophones may vary in the degree of rounding or in openness, which ranges between a position just below near-open [ɔ̞] to open [ɒ]. There is also the possibility that the impression of rounding is achieved more by tongue root retraction than by labial protrusion. For a majority of speakers using the unrounded variant, it was judged to be fully back, close to Cardinal Vowel 5. In some cases, the variant [ɑ] was slightly advanced, and only in a few instances was it advanced to a position approaching an open centralized vowel [ɐ].

Open back /ɑ/

The distribution of the two variants of /ɒ/ for the Vancouver subjects is presented in Table 1. In the schematic presentation of symbols, where either [ɒ] or [ɑ] appears alone, the frequency of occurrence for that variant is at least 67% for that group. A higher than 33% incidence of a competing variant is marked by a tilde (signifying alternation) and enclosed in parentheses. A still higher alternation of a competing variant (greater than 40%) is indicated by only a tilde, without parentheses. Numerical results are also presented.

The usage of the two variants is divided, with [ɒ] more common at 59%, while [ɑ] occurs 41% of the time. Women have a slightly higher incidence of [ɒ] (60.5%) than do men (57.5%). This can be accounted for by the high frequency of [ɑ] in the over-60 male category (59%). Female subjects show a small increase from oldest to middle-age categories, but then a sharp decrease in [ɒ] usage in the youngest age group. Thus, no clear progressive change is in evidence for Vancouver women, although [ɒ] remains the preferred variant in all generations.

Table 1. Distribution of /ɑ/ variants in the Vancouver Survey -- schematic and numerical representations.

Women Over 60	(ɑ ~)	ɒ	99	157
Women 35-60	(ɑ ~)	ɒ	92	164
Women 16-34	ɑ ~	ɒ	112	144
			(39.5%)	(60.5%)
Men Over 60	ɑ	~ ɒ	148	104
Men 35-60	(ɑ ~)	ɒ	94	161
Men 16-34		ɒ	82	174
			(42.5%)	(57.5%)

Male subjects, on the other hand, show a clear progression, by age group, of an increasing incidence of the [ɒ] variant: old-age, 41%; middle-age, 63%; young-age, 68%. The difference from the female pattern, described in more detail elsewhere [7], suggests that either young women are initiating a reverse trend, or that variation among women is freer and not responding to the same forces for change at this point in the vowel space as with men.

Open front /æ/

The choice of /æ/ variants is between a fronted [æ] and a backed [æ̠]. Choices of a more close or a more open variant occur only occasionally and are not included in the calculation of results. Chi-squared tests with one and three degrees of freedom give a rough indication of the significance attributable to one or another cells of the two-pair and four-pair comparisons. Small differences in the 40-50% range are statistically insignificant.

The distribution of variants of /æ/ is compared and interpreted phonetically for all SES classes combined together in each of the three age groups in Table 2.

Older women's usage favours [æ], except in the MMC group where the backer variant appears to have taken hold. This finding supports the accuracy of spectral analysis of formants which suggests that /æ/ is in fact more backed for MMC women than for MWC women, while most other vowels are more fronted. The middle-aged women demonstrate active variation between [æ] and [æ̠], while the younger women clearly favour [æ̠], especially in the MC.

For the men in the Vancouver survey, the same development -- backing of /æ/ -- appears to be in progress, but lagging behind the women by about one generation. As with the women, the youngest group adopts the retracted variant, with the MC leading the change.

In summary, /æ/ appears to be acquiring a more retracted quality in Vancouver English, beginning with individuals with the highest social status, and about one generation earlier for women than for men. Western Canadian English, to the extent represented by the Vancouver survey, differs from American English in this respect, where the trend often reported in the U.S. is

towards a fronted and more close (front   raising) diphthongal variant.

Table 2. Distribution of /æ/ variants in the Vancouver Survey -- schematic and statistical representations.

Women Over 60	æ	(~ æ̞)	}	} p < 0.019	}	}
Women 35-60	æ	~ æ̞	}	} p < 0.0001	} p < 0.0001	
Women 16-34		æ̞	}		}	
Men Over 60	æ		}		}	
Men 35-60	æ		}	} p < 0.0001	} p < 0.0001	
Men 16-34		æ̞	}		}	

ACOUSTIC ANALYSIS

Spectral Peak Distributions

Vocalic inventories for each SES by age by gender group are compared using vowel tokens from the identical lexical contexts to those used in the auditory evaluations, taken from the same reading selection. First and second formant frequencies (F_1,F_2) are calculated for 80% of the 50 tokens for each of the ten vowels in the basic vowel system. In the first instance, a linear predictive coding (LPC) routine in the Computerized Speech Lab (CSL) environment is used. F_1 and F_2 are averaged over 20-msec intervals for the duration of the nucleus for each of 40 tokens representing each vowel class (5 tokens x 8 subjects per survey group), with resulting values written to data files for statistical processing. In the second instance, average spectral FFTs are calculated for the vowel nucleus.

Higher second formant frequency ranges for the older women indicate a more fronted quality of /æ/ than for middle-aged women in all groups except the MMC group. Average spectral evidence for the /æ/ vowel indicates a lower F_2 for MMC women than for MWC women in the oldest age group, suggesting that the more retracted [æ̞] variant is accurate. Variation is considerable among middle-aged women, but younger women show a shift towards a retracted target in the MC SES groups.

Spectral peak measurements for the men demonstrate a higher degree of similarity from SES group to SES group than for the women. This corresponds to the relative lack of SES variability in the men's vowels noted in the auditory judgements. Compared to the women, the men switch later but more abruptly in apparent time to the retracted variant.

Significance Measures

Statistical significance of spectral distributions is assessed through group-by-group means-limits comparisons. In the pronunciation of /æ/, middle-aged MMC women are clearly differentiated from all other SES groups of the same age. They are also differentiated from every older group including those of similar social status except the MWC women. Complementarily, the older MMC women use an /æ/ with a quality different from any other group of their same age except the MWC group at the opposite end of the social scale. For the women in general, UWC and MMC SES groups consistently maintain separate qualities of /æ/.

System-shifting Anomalies

A potentially anomalous situation appears in the F_1,F_2 distributions of other vowels in the set. For most of the ten vowels (other than /æ, ʌ, u/), for example, the mean value of F_2 is higher for the older MMC women than the mean value of F_2 for the older MWC women. Since the tokens have been obtained from identical contexts, the F_1,F_2 distribution would imply that the MMC women's vowels are more fronted than the MWC women's vowels. However, this has been shown *not* to be the case for /æ/, i.e., the rule does not apply in the same way. The only contextual variable likely to interfere with the F_1,F_2 locations is the difference in stress or timing with which some subjects may have spoken the target items as they occurred during the reading passage. However, as the items selected are largely in stressed position, and considering the large number of items represented, it is probable that the shift upwards in F_2 for MMC women is not the result of performance anomalies. It is entirely possible that most of the vowels of the system are shifting in one direction for one group relative to another, *except* for certain key vowels which are shifting in the *opposite* direction.

Long-term Spectral Comparisons

In comparing these vocalic results with earlier results of LTAS (long-term spectral averaging) [6], a few parallels are worth noting. The first is that LTAS techniques reveal wider differentiation among female SES groups than among male SES groups of the survey. Secondly, the age and SES distributions of the open vowels and the distribution of long-term settings isolate certain SES groups. MMC women, for example, are consistently differentiated in LTAS from UWC women, and older MMC women show the clearest separation from all other groups except middle-aged MMC women. As with vocalic distributions, older MC women and younger MC women are more distinct in long-term setting than the set of middle-age women, and both move decidedly in favour of a retracted [æ̞].

As a matter of speculation, it may be less accurate to say that the SES groups are "doing" something with their vowels than to say that *we* are *measuring* something that they are doing; for example, we are probably measuring the middle-age women halfway through a change in which vowel quality is "jostling" with voice quality, or shifting its units around to accommodate a new background setting. Clearly, this hypothesis must be subjected to further testing.

ACKNOWLEDGEMENT

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