Lab 3: Vowel Lengthening

Overview. The duration of vowels varies for a number of reasons: tense vowels are longer than lax ones (/i/ vs. /ɪ/); stressed vowels are longer than unstressed ones (e.g., the /i/ in *Tina likes BOB vs. TINA likes Bob*); and some vowels are just inherently long. For example, Finnish contrasts /i/ with /iː/, such that two words can differ only with respect to vowel length alone, and they mean different things, e.g. /sika/ 'pig' and /siːka/ 'whitefish'. (The colon indicates 'long'.)

Vowel duration in English is measured from the point where vocal fold vibration begins following articulation of a consonant to an abrupt point where a following consonant begins articulation, as with stops, affricates, and fricatives, or to a known acoustic marker signifying a transition to a consonant, as with nasals, liquids and glides. Pre-voicing of an initial consonant is not usually included in the vowel duration measure. Figure 1 below shows the measurement of vowel duration for the vowel in "pat". It is reported in milliseconds.

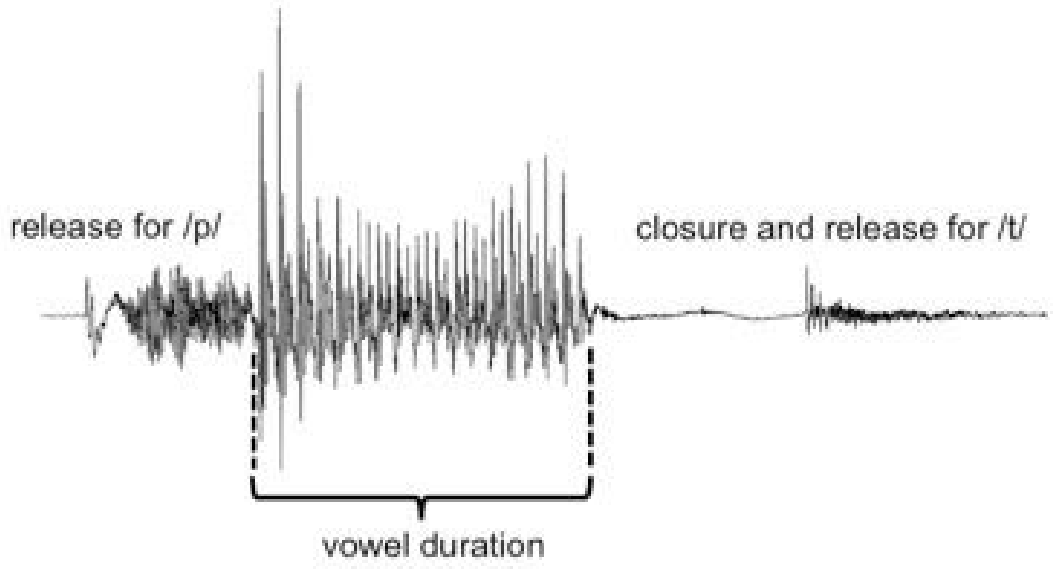

Figure 1: Three different VOT values based on the onset of voicing relative to the release of active articulators.

Problem. Vowel duration varies for reasons other than properties of the vowel itself: it can vary in length as a cue to whether a nearby consonant is voiced or voiceless. In theory, any vowel lengthening could provide a cue to voicing. However, not all consonants will have an effect on vowel length. At issue is whether word-initial or -final consonant positions have an effect on vowel length, and whether the effect is uniform across vowels.

Task. Retrieve the set of files containing a set of words in English for this lab. There are two speakers, whose recordings are saved in separate files, one labeled *Lab 3 Speaker 1.aiff*, and the other labeled *Lab 3 Speaker 2.aiff*. The words and their vowel targets are listed on the following page.

Vowel	**Target word**	**Vowel features**
/i/ː	Pete, peed, beet, bead	High front tense
/æ/ː	pat, pad, bat, bad	Low front lax
/a/ː	pot, pod, bot, bod	Low front lax
/o/ː	tote, toad, dote, Dode	High back tense

Use Praat and the guide above to measure vowel duration for all files. A demonstration of how to measure vowel length using Praat will be given at the beginning of the lab. Then, address the issue raised above: does vowel duration vary as a function of whether the first of last consonant is voiced/voiceless? And, is there any variation across vowels? Across the two speakers? If you are having trouble determining which consonants are voiced or voiceless, use your book, and reference it in your write-up.

Write up report. Follow the format for writing up phonetics lab reports and upload your report on Blackboard.

In writing your hypothesis, be sure to state the conditions under which your hypothesis will be supported or refuted. You can write something like the following, "I predict xxx. Evidence in favor of this prediction will be seen if yyy. Evidence against this hypothesis will be seen if zzz." Then, in the methods section, clearly explain how the data is collected and analyzed in order to support or refute the hypothesis. The results section should be organized solely in the service of addressing whether the hypothesis was supported or not. Arrange and summarize the data in order to maximize the reader's understanding of whether to accept or reject the hypothesis, based on the results you obtain.

Title: Lab 3: Vowel Lengthening, by Len Washington III

Topic. Clearly state the topic that you are investigating. An example would be, "This lab addresses the way adults talk to pets versus infants."

Issue. A description of the issue at stake. An issue is the problem that you are attempting to solve. An example would be, "The special register of infant-directed speech is sometimes claimed to be intended to clearly contrary speech characteristics to language-learning infants, yet speech to prts would appear to share this same special register, and there is no suggestion that adults talk to pets in this way to help them learn language. At issue is whether pet- and infant-directed speech are, in fact, identical." You only need to cite relevant information from our lectures, from the textbook, or from the lab instructions itself to motivate your issue, but however you decide to state the issue, be clear to draw out what is at state in addressing it.

Hypothesis. A statement of the research questions and hypotheses under investigation. A hypothesis is a tentative explanation for an (anticipated) observation of data. An example would be, "Data were analyzed to address the issue of pet- vs. infant-directed speech. I predict that if speech directed to infants is intended to be clear, then such speech would have, among other properties, an expanded vowel space because xxx. In contrast, if pet-directed speech is diminutive and not intended for language-learning purposes, then such speech would be characterized as being merely loud speech and not show any expanded vowel space because yyy." This particular hypothesis requires quite a bit of knowledge of phonetics, which you will not possess at the beginning of the semester. You should state a hypothesis as strongly as your knowledge of phonetics and speech characteristics allow. Don't go out on a limb and guess at things if you are uncertain.

Method. A description of the method. An example would be, "In the lab activity, I recorded x people saying y words to z pets, and then assume x people saying the same words to z infants. Then, I made the following measurements: x, y, and z." Be specific. Explain what equipment you used, or how data were obtained. Define any measurements. An example would be, "Loud speech was defined as any speech with an average intensity of xxx, and expanded vowel space was defined as cases where [acoustic measures] showed yyy."

Results. A description of the results. An example would be, "Results indicated vowel space for pet-directed speech exhibited louder, longer segments, but not a bigger vowel space, consistent with the prediction that such speech is merely loud and not meant to help discriminate among speech sounds. In contrast, infant-directed speech *did* exhibit an expanded vowel space, which I take as evidence as supporting the hypothesis that the special register to infants is for language learning purposes and is acoustically distinct from pet-directed speech." Provide relevant tables, figures of (minimally) descriptive statistics where relevant.

Discussion. A critical analysis of your study. An example would be, "While the study revealed a difference in pet- versus infant-directed speech, it does have some drawbacks. First, I didn't discuss whether infant-directed speech is actually effective in helping infants

to discriminate among speech sounds. Moreover, vowel-space isn't necessarily a strong indicator of an attempt to teach an infant to discriminate among speech sounds in the first place. Rather, an equally plausible explanation could be that adults xxx."