

FORMANT ASSIGNMENT
Effects of vowel context and stress on vowel quality

In this lab assignment, you will investigate the effect of vowel context on vowel quality (that is, the effect of one vowel on another). You will also see whether stress affects the quality or duration of a vowel.

Data: 25 bV₁bV₂bV nonsense words with medial (2nd syllable) stress uttered by 1 speaker

		V ₂				
		[bi]	[be]	[ba]	[bo]	[bu]
V ₁	[bi]	bibibi	bibebe	bibaba	bibobo	bibubu
	[be]	bebibi	bebebe	bebaba	bebobo	bebubu
	[ba]	babibi	babebe	bababa	babobo	babubu
	[bo]	bobibi	bobebe	bobaba	bobobo	bobubu
	[bu]	bubibi	bubebe	bubaba	bubobo	bububu

There are 25 sound files, but they are grouped together into a Praat collection file so that you can open them all at once. Each file contains a word from one cell.

Before you start, look over the rest of the directions and think about how you might be able to explore the suggested questions with your data. Develop some specific hypotheses, and decide exactly which vowels you need to measure to test your hypotheses. (You can also develop post-hoc hypotheses after you have begun to explore the data.) You will not need to measure every vowel in every token. You should also plan what the output of your log file will look like and how you want to arrange your data so that you don't lose track of which measurements are which.

This assignment is more exploratory than the duration lab. The following questions give you some guidelines for things to explore in this data:

- Does vowel context affect vowel quality?
 - Does the quality of V₂ affect the quality of V₁?
 - Measure F1 and F2 at a stable point near the middle of V₁ in each item. If there is no steady state, try to measure at maxima or minima in formants (extreme displacements in the expected directions – e.g., highest F2 in /i/, etc.).
 - Also measure formant values near the end of the vowel (in the transition portion, approximately 10ms from the end).
 - Plot these vowel measurements on an F1xF2 chart. You should plot the midpoints and the edge points separately. Label the data points in terms of the vowel's context (i.e., the neighboring vowel) so that you will be able to examine any effects of context. An example of the type of plot you are trying to create is included at the end of this handout, though yours will not be identical.
 - Does the quality of V₁ affect the quality of V₂?
 - Make appropriate measurements and plot the formant values.
 - Describe the patterns you see, both within each plot and across plots. What factors do you think contribute to the patterns that you see? Are the patterns exactly as you would expect? Please be explicit here. Point out specific examples in your descriptions, and if some expectations are upheld and others not, give examples of each type.

- How does the quality of a vowel at its (approximate) midpoint compare with its quality at the edge?
 - To control for any effects of vowel context, you can focus on just the cases where V_1 and V_2 are the same.
 - Make a vowel plot or plots that illustrate your comparison, and describe the patterns you see. Do the two vowels show the same patterns?
- How does stress affect vowels?
 - Again, to control for effects of vowel context, you can focus on the cases where V_1 and V_2 are the same. You can also look just at the midpoint measurements.
 - Does stress affect vowel quality?
 - Plot the appropriate measurements and describe the results.
 - Does stress affect vowel duration?
 - Measure the durations of V_1 and V_2 in this set of items. Although you will have very few measurements, use a t-test to see whether a significant difference emerges.
 - Describe your findings. Discuss as well how stress might interact with your findings for the first question (about the effect of vowel context on vowel quality). Think about how stress might confound your comparisons of V_1 and V_2 . Suggest an additional set of data that would help resolve the issue and explain how or why.
- How do measurements made from the formant track compare with those made from an LPC?
 - Measure F1 and F2 near the midpoint of each V_1 from an LPC.
 - Compare the values you obtain this way with the values you measured from the formant track. (Since you only measured 5 V_2 s at the midpoint from the formant tracker, you can ignore V_2 for this question.) Compare both graphically and by means of t-tests.

Make sure as you measure that your formant values are reasonable for that vowel.

Your write-up does not have to conform strictly to the layout of a usual experimental report. However, you should briefly introduce your issues and describe your materials and methods before you launch into the main part of the assignment. You should state any hypotheses you have, explicitly describe the comparisons you make, organize and present your measurements (including your plots), report any statistics you perform, and discuss any observations that you made and the conclusions that may be drawn from your data.

