

SLHS 3305W: Speech Science

Homework 1, Fall 2023

The goal of the Palette of Voices project was to record and analyze a set of 20 voices that represent different ways of ‘sounding male’. Most studies on gender and speech exclude transgender and Queer people. Hence, our scientific understanding of what it means to sound ‘male’ or ‘female’ is based overwhelmingly on cisgender, heterosexual people. The Palette of Voices resource includes a variety of men and masculine-presenting people, including transgender men, cisgender men, and transmasculine nonbinary people. The project was completed by Devin Dolquist as part of his 2023 M.A. thesis in speech-language pathology, advised by Ben Munson. Devin’s full thesis document can be found [here](#) if you are interested.

In this laboratory exercise, you will first listen to the 20 talkers as they produce the sentence “*An ample wall needs at least four layers of bricks.*” You will first provide a rating of how fast you think that the person speaks, and how much they vary the pitch of their voices. You will then make objective measurements of rate of speech (in syllables per second) and fundamental frequency variation for the same samples, and you will compare those to your ratings. These measures were chosen because rate of speech and pitch variation predict gender ratings from speech. Faster speech and speech with less pitch variation are generally rated as sounding more male-like.

This homework assignment is due on **October 10, 2023**. You will submit it on Canvas. It is worth 8% of your final grade.

Due Date: October 10, 2023

Submission: Both elements submitted to Canvas.

One file for the Laboratory Component (ratings and measurements)

One document with your Writing Component (3-4 page interpretation)

Grading: 8 points total; worth 8% of your final grade.

General Information:

This assignment has two components: a laboratory component and a writing component.. The goal of the laboratory exercise is mostly to familiarize you with Praat. This will be done in the context of measuring rate of speech and fundamental frequency for the 20 talkers from the Palette of Voices project.

Learning Goals:

1. To *familiarize* you with the process of making acoustic measurements using Praat.
2. To *increase your appreciation* for the consequences of manipulations of sampling rate and quantization.
3. To allow you to *demonstrate your skill* at writing about speech-science topics using terminology that is accessible to a broad audience.

Grading:

As per the syllabus, this assignment will be worth 8% of your grade in the course. It will be graded on a eight-point scale.

Three of these points will be for your laboratory work. They will be assigned as follows:

- Two points will be based on the accuracy of your measurements
- One point will be based on the accuracy of your calculations

Five of the points will be for your writing assignment. This part of the rubric was informed by the Department of Speech-Language-Hearing Science's Writing Enriched Curriculum. This assignment addresses two of the six desired writing abilities for students in SLHS:

- **Intentionally and sensitively address specific readers.** SLHS students are expected to demonstrate the ability to adapt their writing to meet the needs and expectations of specific readers within the field, By intentionally and sensitively addressing specific readers, students enhance their communication skills, promote understanding, and contribute to effective knowledge dissemination in the speech-language-hearing sciences.
- **Describe processes, sites, and data.** Students should be able to express their ideas clearly and concisely, using appropriate language and terminology specific to the field of SLHS. This includes communicating complex concepts in a straightforward manner and avoiding unnecessary jargon or technical language that may hinder understanding.

The five points for writing will be assigned as follows:

- Two points for technical writing to a non-technical audience, broken down into two points for defining complex terms using simpler concepts that a non-technical audience would understand, and one point for writing at a no more than an 8th grade level, as described in [this link](#).
- Two points for accurately describing the data.

The rubric is summarized below:

Laboratory Component

Accuracy of Measurements	2 - No more than 4 measurements that are greater than 40 Hz different from the TAs (for f0) or 0.05 s different from the TAs (for sentence duration)	1 - between 5 and 7 measurements that are greater than 40 Hz different from the TAs (for f0) or 0.05 s different from the TAs (for sentence duration)	0 - 8 or more measurements that are greater than 40 Hz different from the TAs (for f0) or 0.05 s different from the TAs (for sentence duration)
Accuracy of Calculations		1 - No more than two calculations (of f0 range and rate of speech) are inaccurate	0 - Three or more errors in calculations

Writing Component

Technical Writing to a Non-Technical Audience	2 - No cases where you use a scientific term without defining it accurately	1 - one or two cases where you use a scientific term without defining it accurately	0 - three or more instances of using a scientific term without defining it accurately
Data Accurately Described	2 - No cases where your description of the data do not match your calculations	1 - one or two cases where your description of the data do not match your calculations	0 - three or more cases where your description of the data do not match your calculations
Data Objectively Described	1 - the reading level is at or below 8th grade	0.5 - The reading level is between 9th and 12th grade	0 - the reading level is above 12th grade

1. **Laboratory Component.**
2. Listen through all the files to hear the 20 talkers as they produce the sentence “*An ample wall needs at least four layers of bricks.*”
3. Listen to the 20 files again. Rate how fast the person speaks from 10 (very fast) to 1 (not very fast). Also rate how much the person varies the pitch of their voice when they are speaking, from 1 (no pitch variation) to 10 (extremely variable pitch). Record your ratings in the table below (make a copy of it and put it in a document)

You will then make objective measurements of rate of speech (in syllables per second) and fundamental frequency variation for the same samples, and you will compare those to your ratings. These measures were chosen because rate of speech and pitch variation predict gender ratings from speech. Faster speech and speech with less pitch variation are generally rated as sounding more male-like.

A video description of the methods and procedures for the laboratory component of this assignment can be found in the videos below. The first video describes the calculation for rate of speech incorrectly; the second video corrects this. The directions in the table below are correct: to get the rate of speech, you take the number of syllables in the sentence (in this case, 12) and divide it by the duration of the sentence).

Please note that you will need to download the 20 .wav files for this laboratory assignment from Canvas onto your computer. Follow the instructions in the link above to make your measurements.

You will be submitting your ratings as one of your documents, so you should copy the two tables below into a MS Word or Google Doc.

Ratings

Please listen to all 20 samples one time each. Then, go through the 20 files again and rate each sample on two, 10-point scales. Rate how fast the person speaks from 10 (very fast) to 1 (not very fast). Also rate how much the person varies the pitch of their voice when they are speaking, from 1 (no pitch variation) to 10 (extremely variable pitch).

Sentence	Rate of speech	Pitch variation
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S1

S2

S3

S4

S5

S6

S7

S8

S9

S10

S11

S12

S13

S14

S15

S16

S17

S18

S19

S20

Measurement.

Next, complete the objective measures, using the instructions in the video above.

Sentence	Duration of the spoken sentence (s)	Speech rate in Syllables per second (=12 [the number of syllables in the sentence] divided by the duration of the sentence)	Highest f0	Lowest f0	f0 Range (highest minus lowest)
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S1

S2

S3

S4

S5

S6

S7

S8

S9

S10

S11

S12

S13

S14

S15

S16

S17

S18

S19

S20

1. **Writing Component: Interpretation.** Your answer to these interpretation questions should be about three double-spaced pages long (including any graphics you make), and no more than four double-spaced pages long. Use Times New Roman 12 and margins that are no wider than 1 inch.
1. Compare your rating of speech rate to the objective measure of speech rate, and your rating of pitch variation to the objective measure of pitch variation. You can do this comparison in whatever way you like, including making graphs or other figures if you like. Then, answer these questions: How strongly did your ratings correspond to the objective measures? Was the correspondence higher for rate of speech or pitch variability?
2. Imagine that one of your transfeminine friends is receiving gender-affirming speech and voice services from a speech-language pathologist. Two of the goals that the person is working on are to speak more slowly and to use a greater pitch range. Your friend's speech-language pathologist uses objective measures of rate in syllables per second, and pitch range in Hz, during the therapy sessions. Your friend makes the following comment:

"It's weird. I trust that my SLP is doing the right thing, but I just don't understand what she's doing when she makes these measurements. Plus, they don't always line up with how I hear myself. You're going to be an SLP, right? What can you tell me about this?"

Respond to your friend. In doing so, share the lessons you learned in doing this homework assignment, and what you have learned in class thus far. To be clear, the goal of this assignment is not for you to show that you have expert-level deep scientific knowledge of acoustics, pitch variation, and rate of speech. Instead, the goal is for you to begin to think about *scientific communication* to increase *health literacy*. Have fun with this!

Please note that you are *not required* to do any research for this assignment. You can base your response on the knowledge that you have gained in class and your own lived experience. However, as in all writing assignments, you are bound to rules regarding proper referencing. If you choose to consult any resources, you should reference all of them, preferably using the format outlined in the *Publication Manual of the American Psychological Association* (sometimes called the *APA Manual*).

You should not use Chat GPT for this assignment, which we created intentionally because it does not lend itself neatly to using AI.