Project 2
Perceptual Confusion Experiment

1. Aim

The goal of this assignment is to provide you with hands on experience in designing and running a speech perception experiment in order that you gain first hand knowledge of perceptual phenomena as they relate to the acoustics of speech as well as a sense of experimental design, method, and reporting.

2. Overview

A perceptual confusion experiment is an experiment in which you test the confusability of a set of segments with one another. The assumption is that phonemic inventories are sound systems. That is, each sound can only be fully understood in relation to other sounds in the system. The logic of a perceptual confusion experiment follows directly from this assumption as it is meant to get at how well individual sounds are perceived with respect to other sounds in the system (think perceptual distinctiveness).

Although it is possible to test the relative perceptibility of all sounds within an entire system (e.g., the 44(?) phonemes of English) in all possible syllable positions, it is usually preferable to ask a specific question about a subset of sounds. A specific question focuses the hypothesis, makes the experiment tractable, and makes for a better argument. For example, in Redford & Diehl (1999), we asked a question about the relative perceptibility of initial vs. final consonants in CVC monosyllables. In addition, we restricted our consonant set to the natural class of voiceless obstruents. In this way, we were able to look at a couple of consonant-dependent variables (e.g., place and manner of articulation) without overwhelming the analyses (i.e., the argument) with a huge number of potentially influential variables (e.g., voicing, nasality, openness, formant transitions).

On the other hand, it is possible to overly restrict your question, i.e., your stimuli set. When you do this you defeat yourself before you even begin because you are unable to collect sufficient data to make a compelling argument for any hypothesis. So, the crucial and difficult task in designing an experiment is the same as the crucial and difficult task in living: striking a balance. In the case of an experiment, you need to find a balance between what you want to know, what time and other resources you have available to you, and how compelling you want your argument to be.

In this assignment, you will be asked to come up with a balance between your question, your design, and your argument by yourself, though we will give you quite a bit of guidance along the way. If you discover that you need more guidance than you are receiving by passively reading these handouts or listening in class/discussion section, then ask one of us for help. Do not wait until the last week of class to formulate your question and design your experiment. If you do, you will not be able to complete this project in time, and it must be handed in on time.
3. Method

A. STIMULI

The stimuli you create will be entirely dependent on the kind of question you want to ask. Are you curious about the relative perceptibility of the segments that make up the natural class of sonorants? Are you interested in the effect of syllable position on consonant perception? Are you interested in the effect of vowel height on obstruent perceptibility?

Whatever it is, make sure that you create the stimuli to answer the question, and make sure that you control for all other variables that could affect your outcome that you are not interested in studying. That is, if you are interested in the relative perceptibility of sonorants, then vary sonorants, but do not vary vowels, unless you plan on examining the effect of vowels on sonorant perception and how different vowel classes interact with different sonorant classes.

Make sure each instance of a type within a class is sufficiently represented in your final stimuli so that you can get some real data. For instance, if you are studying sonorants, make sure that the nasal [m] shows up several times (ideally 10 times or so) in your final set, so that you can collect several responses to this type. The more responses you have per type the easier it will be to compare between types (i.e., 10 responses to [m] and 10 responses to [n] and so on and so forth should allow you to say something above chance about the differential perceptibility of these segments).

B. RECORDING

Randomize the order of your stimuli and record them in a frame sentence as *.wav files. Label each of the stimuli phrases with its random order number. That way, when you grab all the files to play them to your subject, they will play forward in a random order, and the subject will not be able to guess the appropriate response from the file name.

If you choose to present your stimuli set as a continuous audio stream (i.e., one right after the other), then you need to make sure that each token is buffered with enough silent time so as to give the subject enough time for a response.

Make sure that you keep a list of what token occurs in what random order. If you have no list, you will not be able to evaluate the subjects’ responses, and you will have no data.

C. SUBJECTS

You need to test a minimum of 2 subjects, so that you can make sure that your results are not due simply to individual weirdness.
D. TASK

Subjects will be instructed in the task ahead of time, and informed that they are participating purely on a voluntary basis, and that they can quit the task at any time for any reason.

Subjects will be asked to wear earplugs (make sure you specify in your methods section the advertised attenuation qualities of the earplugs that you are getting your subjects to use), and to listen to your stimuli set at a preselected volume (that you will also note in your methods section). Subjects will be instructed to write down the nonsense word that they hear in the response sheet that you provide.

E. ANALYSES

After you have run your subjects, you will need to score their data, in order to conduct your analyses. Score incorrect responses as “1” and correct responses as “0”. This will make it easier to count up number of incorrect and present this in terms of average percent correct, which will be the main way in which you will discuss your data.

4. Results

As with Project 1, it is important that you present your findings in a coherent and organized fashion. In particular, you should be organizing your findings in a way that seems to get at the question that you were asking in your design. For instance, if you tested the relative perceptibility of initial vs. final consonants, then you should definitely be comparing the perceptibility of initial and final consonants in your results section. In addition, remember to explore other factors that may be working for or against your question. For example, show how place and manner of articulation influence your overall finding that final consonants are less well perceived than initial consonants. All of these comparisons and rhetorical points should be made in tables and chart similar to those you presented in Project 1. The text in the result section (and there should be text in the results section) should be built around the tables and charts where you are displaying your main results. Minor results should also be presented, but these should only be commented upon in the prose of this section.

5. Discussion

This section is devoted to your argument based on your findings (see JJ’s first handout titled “Phonetics Lab: General Information” point 2.b). Think about what you have learned in your experiment, and coordinate that with what you have learned from class and from the readings. Make the whole discussion gel around a single idea or related set of ideas. For instance, “…final consonants are less perceptible than initial consonants. The results suggest that this is because final
consonants are articulated less clearly than initial consonants. This may be because they contain less information, as might be argued by proponents of Information Theory. In this theory… Or, final consonants may be less perceptible than initial consonants because… Several factors lead us to favor an Information Theory account over the alternative account. One such factor is…”

6. Conclusion

This is a brief note about what you have concluded from your study and what you think the next logical step should be in your search for the ultimate understanding of X.