# Consonant Perception test

Introduction
The Vowel-Consonant-Vowel (VCV) test is used in clinics to evaluate how well a listener can recognize consonants under different conditions (e.g. with and without lipreading). It is a simple test to run, yet very informative, as the patterns of errors can reveal which phonetic features a listener is able to perceive.

In this laboratory, you will test your recognition of consonants under 3 conditions: **Audio-only**, where the audio signal has been low-pass filtered to grossly model the auditory signal that a profoundly hearing-impaired listener may perceive; **Visual-only**, where you will see a video of the talker with no sound; and **Audiovisual**, where the low-passed audio will be combined with the video. By looking at patterns of errors, you will be able to see what acoustic information to place, manner and voicing is present at low frequencies and what distinctions are possible via lipreading alone. You will also get some impression of how audiovisual integration works.

Stimuli and apparatus
The stimuli consist of audiovisual recordings of an adult female speaking VCV nonsense words. There are 22 different consonants (displayed in the figure below) and the vowel context is /a/-/a/. There are three recordings of each consonant, for a total of 66 stimuli.

The audio tracks of the stimuli have been low-pass filtered with a 500-Hz cut-off frequency. The audio stimuli will be presented to you over headphones, and you will see the video of the talker presented on the computer screen. You will click on buttons on the computer screen to record your responses, as shown below.

Practice trial 3
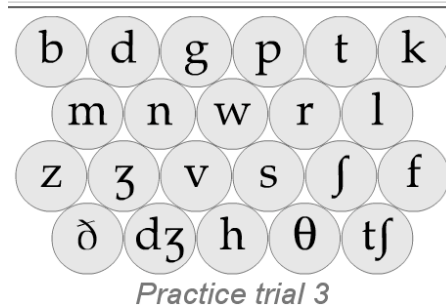
Method and instructions

(1)   Type in your name and select the stimulus condition (Audiovisual, Audio-only, or Visual-only). You will need to test yourself three times, and each time you will need to select a different condition. You can run the conditions in any order that you want.

(2)   Each experiment will start with 5 practice trials that will not be included in your results. Immediately following the practice trials, you will complete 66 experimental trials presented in a random order. On each trial, click on the phonetic symbol that matches the consonant that you heard. If you are not sure, give your best guess.

(3)   At the end of the experiment, press the button to print out your results. ***Please print your results in landscape format***, so that they will be easier to read. Ask the lab supervisor if you do not know how to do this.

Data analysis
The first page of the printout will display a list of stimuli and responses for every trial, a confusion matrix (i.e., a summary of how often you confused different consonants), and the number of correct responses.

The second page will display an analysis of your data in terms of your recognition of voicing, place, and manner. Imagine, for example, that you were given the stimulus /d/ and you said that the consonant was /v/. Although your answer would be wrong, the answer would be correct with regard to voicing because /d/ and /v/ are both voiced. Your answer would be incorrect with regard to place because /d/ is an alveolar and /v/ is a labiodental. Your answer would also be incorrect with regard to manner because /d/ is a plosive and /v/ is a fricative. The analysis will display which voicing, place, and manner features you confused.

There is a problem with comparing the percentages correct for voicing, place, and manner, because each of them have different levels of chance performance. For example, if you scored 50% correct for both voicing and place, it would mean different things in each case; you would be at chance for voicing (i.e., the same as random guessing), but well above chance for place (i.e., meaning that you could perceive a good amount of the information). Because of this, we prefer to use another measure, *the percentage of information transfer*. This is a mathematically complex measure of how much information you were able to get from the stimulus condition, with 0% indicating that you did not get any information (i.e., the same as random guessing) and 100% indicating that you got all of the information perfectly. We prefer this measure because it corrects for chance performance, and is thus more comparable across the different features. For example, if you had a score of 50% information transfer for both voicing and place, in both cases it would mean that you were able to perceive half of the information.

Observations

1. On the first page, take a look at your response for every trial and check it against the confusion matrix. Make sure that you understand how the confusion matrix was constructed. Likewise, take a look at some of the responses displayed in the voicing, place, and manner matrices, and find out how they relate to the main confusion matrix on the first page.

2. Plot the percentage of correct information transferred for Place, Manner and Voicing for the three test conditions on a bar chart.

3. How well were you able to correctly judge whether sounds were *voiced or unvoiced?* (NB: Give examples of sound confusions commonly observed)

    a. when only frequency components below 500 Hz were present:

_____

_____

_____

    b. when only lipreading cues were available:

_____

_____

_____

    c: when both modalities were combined:

_____

_____

_____

4. How well were you able to correctly judge the consonants' *place of articulation*: (NB: Give examples of sound confusions commonly observed):

    a. when only frequency components below 500 Hz were present

_____

_____

_____

b. when only lipreading cues were available:

_____

_____

_____

c. when both modalities were combined:

_____

_____

_____

5. How well were you able to correctly judge the consonants' *manner of articulation*: (NB: Give examples of sound confusions commonly observed):

a. when only frequency components below 500 Hz were present

_____

_____

_____

b. when only lipreading cues were available:

_____

_____

_____

c. when both modalities were combined:

_____

_____

_____

6. On the basis of these results, which speech sounds are likely to be most problematic for hearing-impaired listeners?

_____

_____

_____

THINGS TO THINK ABOUT:

7. Were you able to use any 'top-down' information when doing this test?

_____

_____

_____

8. An interesting analogy has been made between the problems faced (a) in decoding speech patterns and (b) in the visual decoding of handwriting. Think of analogies in the reading of handwriting for the following:

Between-speaker variability: _____

_____

Within-speaker variability:_____

_____

Coarticulation:_____

_____

Segmentation:_____

_____

Noise:_____

_____

The lack of necessary or sufficient features:_____

_____

_____