

**6.542J, 24.966J, HST.712J LABORATORY ON THE PHYSIOLOGY,
ACOUSTICS, AND PERCEPTION OF SPEECH
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Lab 11

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Introduction to Speech Disorders

References

Daniloff, R.G., K. Wilcox, and M.I. Stephens (1980), *An acoustic-articulatory description of children's defective /s/ productions*. **J. Communication Disorders** **13**, 347-363.

Monsen, R.B. (1976), *Normal and reduced phonological space: The production of English vowels by deaf adolescents*. **J. Phonetics** **4**, 189-198.

Minifie, F.D. (ed.) (1994), **Introduction to Communication Sciences and Disorders**, San Diego: Singular.

Ohde, R.N. and D.J. Sharf (1992), **Phonetic Analysis of Normal and Abnormal Speech**, New York: Macmillan.

Disorders of speech production can arise from a number of causes. They can be a consequence of deviant anatomical structures, they can arise from lack of sensitivity to or awareness of particular phonetic contrasts, they can be a result of neurogenic disorders that make it difficult to control and to sequence sounds, syllables and words, and they can be caused by failure to acquire the motor skills needed to produce particular speech sounds or speech sound sequences. Some of these disorders occur because of improper adjustment of articulatory structures that play a role in the production of almost all speech sounds including the supralaryngeal structures, the larynx, and the respiratory system. Examples are inappropriate adjustment or configuration of the glottis, a velopharyngeal opening that is maintained throughout an utterance, or inappropriate control of respiration. Other problems are associated with the production of individual sounds, either because of the lack of ability to shape the articulatory structures or because the speaker is unaware of or is insensitive to a particular phonetic contrast. For example, a speaker may be unable to make the

sound /l/, or may be unaware of the distinction between the words **meet** and **mitt**. Still other problems are associated with neurological control of the articulatory structures. Thus a speaker may be unable to plan the sequencing of movements for an utterance longer than a single syllable, or may have difficulty coordinating the movements of the lips and the velopharyngeal opening in a word like **dim**.

In this laboratory we will examine some utterances produced by adults and by children with several types of speech disorders. By looking at the acoustic properties of disordered speech, we will try to make inferences about the articulatory configurations and movements that give rise to the speech.

Stored in labc/ken subdirectories of the unix workstations are several examples of disordered speech. These are identified in the following descriptions.

1. Misarticulation by children.

In /misart there are several utterances produced by normal children and by children who misarticulate several sounds.

Included are four versions of the word **sap** produced by children. These are intended to illustrate some kinds of misarticulations of the sound /s/ that occur for some children. One of the words (sapn8A1) is normally produced. Three others (sproap8A1), slap8A1, sdap8A1) have been described by speech pathologists as “protruded”, “lateralized”, and “dentalized”, respectively. From spectrograms and from other kinds of acoustic analysis you may choose to do, describe the acoustic attributes of the /s/ for each of these utterances, and suggest how the deviant articulations might give rise to the observed acoustic attributes.

In the same directory there are three versions of the word **dairy** (dairy 1a, dairy 1b, dairy 3b) and two versions of **parade** (parade 1a, parade 1b). Two of these words are normally articulated by children and the other three have some misarticulation. Listen to the words and make spectrograms (or other acoustic analyses). Describe the misarticulation and explain in terms of the acoustic data why the words sound the way they do.

2. Speech of deaf children.

In the subdirectory /deaf there are five utterances. Four of these are the utterance “the paper”, three produced by deaf children and one produced by a normal-hearing adult speaker. The fifth utterance is the sentence “She keeps it in a tank”, produced by a deaf child.

Listen, make spectrograms, and, if necessary, do further acoustic analysis of the utterances of “the paper”. Describe any deviations from normalcy of the utterances produced by the deaf children. Possible differences might include incorrect articulation of vowels or consonants, inappropriate timing, deviant glottal configuration (such as breathiness), etc.

Listen to and analyze the utterance “she keeps it in a tank”. Describe any deviations from normal in the sound, and comment on the articulation that gives rise to these deviations.

3. Dysarthric speech.

In the subdirectory /dysarthria there are several words produced by several speakers with dysarthria as well as some normal speakers. Neurogenic disorders lead to different types of speech disorders that are given the general name “dysarthria”.

Listen to each of the words and make spectrograms of each. You may also wish to do additional acoustic analysis. Describe several attributes of the speech by the dysarthric speakers that show significant differences from what you might expect in normal utterances. Examples of differences include timing problems, deviant production of vowels and consonants, deviant spectral characteristics of vowels arising from extra (possibly subglottal) resonances and from noise at the glottis, etc.