

The course website is reachable from <http://www.fon.hum.uva.nl/paul/>

Lecture 1 (30 October 2012)

Warning. You have to email the assignments to us no later than Wednesday night. You are advised to do assignment 2 early, so that in case you have trouble installing or handling PRAAT or finding or downloading the speech files, you can contact your fellow students or us early enough. Notice that such problems can be no excuse for failing to hand in this assignment, because you are at the MA level so that problem solving skills are assumed (not handing in = no grade). You are equally advised to do assignment 1 not long before Lecture 2, because your understanding of what you have read will be checked and extended during the first part of Lecture 2.

Assignment 1: read Hayward chapter 1.

While reading, please think of how Hayward simplifies matters too much in some cases. Please read closely, taking into account what you have learned during the Speech Perception and Production course (if you followed that). For phonetic symbols that you encounter, refer to page 264.

Some questions for you to answer before Lecture 2 are the following.

1a. Figure 1.1 shows a feedback loop only in production. Could you think of a theory that has a feedback loop in comprehension as well? What could be the meaning of such a loop in comprehension?

1b. In §1.4.1 Hayward writes: “the question of how a linguist might decide that two sounds which he or she hears as different really are ‘the same’ in the system of the language he or she is studying is one which we cannot take up here.” That is a pity, certainly in the light of what Hayward wrote in §1.1 (“the relevance of speech for the study of language in general”, “the orientation of the book is primarily linguistic”).

So please provide one or more criteria for deciding a slightly different issue, namely whether two sounds in sequence constitute one segment or two. You should preferably come up with an example language here. If you cannot find a case, then think of affricates such as [ts] and [tʃ], which could be single segments in one language (i.e. \sqrt{ts} and $\sqrt{tʃ}$) or double segments in another (i.e. /ts/ and /tʃ/). If you cannot find an example language for this, then try Hungarian or perhaps Spanish.

1c. In §1.4.1 again, Hayward gives narrow transcriptions for English *pan* and *nap*, and they could even have been narrower, namely [p^hæ:n] and [næ^ʔp^ˀ] (what two phonetic details did I add?). Practice pronouncing these two words in every phonetic detail.

1d. Please list any doubts that you have about details of chapter 1, or any questions that you think should have been answered but aren't. [This part of the assignment will not be graded, but answering it will help in getting a good grade in the discussion in Lecture 2]

Assignment 2: measure average durations.

I will now introduce our first phonologically-informed research question. It is about Dutch vowels.

Phonologists usually agree that Dutch has both short and long vowels. Short vowels occur in *had* /ɦɑt/ ‘had’, *hit* /ɦɪt/ ‘hit (successful song)’, *lot* /lɔt/ ‘lot’, *hut* /ɦyʏt/ ‘hut’, and *het* /ɦɛt/ ‘it’, and long vowels occur in *haat* /ɦaːt/ ‘hate’, *heet* /ɦeːt/ ‘hot’, *boot* /boːt/ ‘boat’, and *leut* /lɛːt/ ‘pleasure’. There is not only a difference in phonetic duration, there are also differences between the two groups with respect to structural restrictions; for instance, the long vowels can occur at the end of words (*la* /laː/ ‘drawer’, *zee* /zeː/ ‘sea’, *zo* /zoː/ ‘so’, and *sneu* /snøː/ ‘pitiful’), the short vowels cannot (except for some interjections such as *bah* /ba/ ‘yuck’, *hè* /ɦɛ/ ‘right?’, and *joh* /jɔ/ ‘come on’).

There is less agreement on the remaining three vowels, the high vowels. Surprisingly many people transcribe these as long, even when transcribing child speech, for instance: *lied* /liːt/ ‘song’, *minuut* /mi(:)ˈnyːt/ ‘minute’, *hoed* /ɦuːt/ ‘hat’ [if any phonetic symbol here is unfamiliar, please ask, because I assume you know all of the ones on page 264 of the book]. One reason for including these three sounds with the long vowels is that they can occur at the end of words (*die* ‘that’, *nu* ‘now’, *hoe* ‘how’); if they are phonologically long, therefore, the structural restrictions on the ends of words can be generalized in terms of the feature value [+long] (or in terms of bimoraicity). Still, I think the high vowels are short, one reason being that they have a phonetic duration similar to that of /ɑ ɛ ɪ ɔ ʏ/, another that they contrast with long vowels in loanwords such as /anaˈliːzə/ ‘analysis’, /sɛntriˈfyːʒə/ ‘centrifuge’, and /kɔmˈpjʊːtər/ ‘computer’. Some people take an intermediate standpoint, claiming that the three high vowels are longer than /ɑ ɛ ɪ ɔ ʏ/ but shorter than /aː eː oː øː/.

The phonologically interesting question, now, is: are there phonetically two groups or not, i.e. are the durations of /ɑ ɛ ɪ ɔ ʏ i y u/ similar and much shorter than those of /aː eː oː øː/? Or is the phonetic division /ɑ ɛ ɪ ɔ ʏ/ versus /aː eː oː øː iː yː uː/? Or are there phonetically three groups (/ɑ ɛ ɪ ɔ ʏ/, /i y u/, /aː eː oː øː/)? Or does every vowel have its own duration?

Why is this question phonologically interesting? Because if the durations of /i y u/ are indistinguishable from those of /ɑ ɛ ɪ ɔ ʏ/, we have a case of *perfect neutralization of phonetic duration*, or a *discrete (non-gradient) coalescence*, which strongly suggests that the similarity between the two groups is taken care of in the discrete (non-continuous) part of the grammar, i.e. in the part that does computations with a finite number of different symbols, i.e. in the phonology. Thus, if the durations of /i y u/ are indistinguishable from those of /ɑ ɛ ɪ ɔ ʏ/, all these eight vowels may have to be represented phonologically (at Surface Form) as [-long] (or as monomoraic), and the structural restrictions cannot very well be expressed by generalizing over [+long] (or bimoraic).

To answer the question partly, we are going to measure the durations of /aː/ (uncontroversially long), /ɪ/ (uncontroversially short), and /i/ (whose duration is yet to be checked).

You do not have to record any Dutch speakers. The recordings are already there, in a *speech corpus* that Rob van Son has collected. This is the *IFA corpus*. Go to the home page of the IFA (Institute of Phonetic Sciences), reachable from the address above. Then click *IFA spoken language corpora*, then *IFA corpus*, then *Speech files*, then

sentences, then *fm* ('fixed microphone'). There are various kinds of recordings, and the spontaneous natural speech recordings are probably best if we want to find out what people do when speaking. However, since most of you do not know Dutch, we go to the HVD set instead (say 'hache-vowel-dee'). This is a set of recordings of the meaningless sequence ***hiet*** – ***hit*** – *heet* – *het* – *huut* – *hut* – *heut* – ***haat*** – *hiet*. The three words in bold are the ones relevant for us.

There are eight speakers: F20N, F28G, and so on. The initial F or M indicates the sex, the 20 or 28 the age. The relevant recordings are in files with names like F28G1FPA1HVDA_fm.aifc.

From the waveforms and the spectrograms, measure the durations of /a:/, /ɪ/ , and /i/ for the four female and the four male speakers (the HVDA_fm files). Do this in PRAAT (www.praat.org) by selecting the relevant part of the word. In order that I can see what you did, cut out these parts *for one randomly selected speaker* with **Extract selection (preserve times)...**, and draw the 3 resulting sound objects stacked above each other in the picture window (use **Text top...** to provide a legend with speaker name and vowel category; you can type the /ɪ/ as \iɛ).

So what do you hand in? The picture of three sounds, perhaps copy-pasted into Word, and all the 24 durations, expressed in milliseconds (**2a**). Then compute the three average durations (each is averaged over 8 speakers) in the following way.

You cannot probably compute any averages by eye here. So compute the average duration for /ɪ/ by hand (summing and dividing), and show in your Word file how you did that (**2b**). Compute the average duration for /i/ by typing a formula into the **Calculator...** (Ctrl-U) in PRAAT, and copy this formula into your Word file (**2c**). Compute the average duration for /a:/ by writing a PRAAT script (**New Praat script...** from the **Praat** menu). Here is how you would proceed. A simple script uses five variables (adapt the script to your needs):

```
duration [1] = 134.2
duration [2] = 123.5
duration [3] = 139.1
sum = duration [1] + duration [2] + duration [3]
average = sum / 3
echo The average duration is 'average' milliseconds
```

This script works for the case at hand, but it can be made more general. We see that it can be written like this, with a repetition in it:

```
duration [1] = 134.2
duration [2] = 123.5
duration [3] = 139.1
sum = 0.0
sum += duration [1]
sum += duration [2]
sum += duration [3]
average = sum / 3
echo The average duration is 'average' milliseconds
```

Everything repeats, except the index 1, 2, 3. Now we make the index repeat as well, by putting it into a variable:

```
duration [1] = 134.2
```

```

duration [2] = 123.5
duration [3] = 139.1
sum = 0.0
speaker = 1
sum += duration [speaker]
speaker = 2
sum += duration [speaker]
speaker = 3
sum += duration [speaker]
average = sum / 3
echo The average duration is 'average' milliseconds

```

Programming languages have a shortcut for such indexes that cycle from 1 to 3. This shortcut is called a *for-loop*:

```

duration [1] = 134.2
duration [2] = 123.5
duration [3] = 139.1
sum = 0.0
for speaker from 1 to 3
    sum += duration [speaker]
endfor
average = sum / 3
echo The average duration is 'average' milliseconds

```

The script can be made even more general by separating the data from the algorithm, as in the following:

```

duration [1] = 134.2
duration [2] = 123.5
duration [3] = 139.1
numberOfSpeakers = 3
sum = 0.0
for speaker from 1 to numberOfSpeakers
    sum += duration [speaker]
endfor
average = sum / numberOfSpeakers
echo The average duration is 'average' milliseconds

```

Now copy your version of the script into your Word file (**2d**). It is very important now to read the first four sections of the scripting tutorial in Praat!

You have now seen three different ways of computing the average (or *mean*). Please tell us for each vowel how many measured durations are greater than the mean, and how many are less than the mean (**2e**).

Finally, collect your results in a table, like the following, but of course with more lines, and copy it into your Word file (**2f**).

Speaker	Sex	Age	i	ie	aa
F20N	f	20	128.1	140.4	190.9
F28G	f	28	160.2	154.0	223.0

You will need this table again in the next assignment and in the following lectures.