

Groningen 30 januari 2004
Workshop
On the Boundaries of Phonology and Phonetics

Phonetics in Phonology

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Outline

Topic: the role of phonetics in phonology

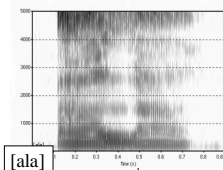
- 1 – Phonology without Phonetics:
Schwa-insertion in syllable-final consonant clusters
- 2 – Interaction of Phonetics and Phonology:
The realisation of liquids in first language acquisition data
- 3 – Problematic Phonetic Analysis:
Rhythmically-variable Patterns

Phonetics vs. Phonology

Both the phonetician and the phonologist are interested in speech sounds

Phonetics vs. Phonology

Phoneticians study the physical properties of sound making





Phonologists are interested in the sound system of a language

They want to know

- the function of sounds in the language (what are the phonemes?)
- the way sounds can be combined
- how the sounds are realized in different contexts

Dutch /r/-varieties

- /r/ can be realized as [r] or as [R]
 
- phonetics: two different sounds:
 - [r] is produced as a trill of the tip of the tongue against the alveolar ridge
 - [R] on the other hand is produced as a trill of the uvula in the back of the mouth

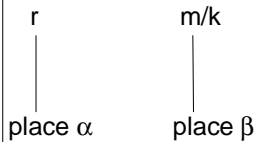
Dutch /r/-varieties

- /r/ can be realized as [r] or as [R]
- phonology: same segment; no functional (semantic) difference in the system between [rat] and [Rat].
- In the system /r/ is coronal, just like /t/ and /s/

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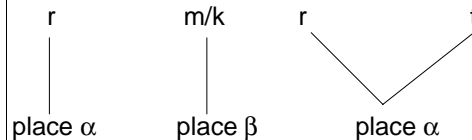
First Process: Schwa insertion in final consonant clusters

data: *harp, darm, durf, borg, hark*



Example: Schwa insertion in final consonant clusters

data: *harp, darm, durf, borg, hark*
no insertion if the consonants share their
place of articulation: *hars, hart, mars*



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From a phonetic point of view uvular [ʀ] and alveolar [t] do not share their places of articulation, from a phonological point of view they do. Yet, schwa insertion is also impossible between [ʀ] and [t].

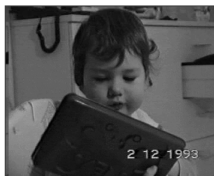
Conclusion

Synchronically, the process can only be described in a phonological way, even though it may have had a phonetic - articulatory - base originally

Probably, the uvular [ʀ] is a later variant of Dutch /r/ than coronal [r]

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Second Process: /l/-substitutes in First Language Acquisition Data



/l/ → [w]

Feature Changes /l/ → [w]

/l/	→	[w]
+son		+son
+cons		-cons
+cont		+cont
+lat		-lat
-lab		+lab
+ant		-ant
+cor		-cor
-high		+high
-back		+back
-round		+round

Feature Changes /l/ → [w]

/l/	→	[w]
+son		+son
+cons		-cons
+cont		+cont
+lat		+lat
-back		+back
-round		+round

What's wrong with the phonologically-based account of the gliding process?

Data

• Smith (1973)	label left rabbit	[we:bu] [wept] [wæbit]
• Fikkert (1994)	klok trein	[kwøk] [tjein]
• Van der Linde (1998)	lief krokodil hallo	[wi:f] [kokodrw] [hajo]

The Naturalness of a Common Process

- McCarthy (1988, p.86): A common process (...) is accomplished by an elementary operation of the theory. [An uncommon process is far more complex to state].
- Gliding is a widely attested phonological process, but it has to be accounted for phonologically as a very marked process, because almost all features change value.
- What is the phonetically-based account of gliding?

Liquids and Glides Perceptively

(Ainsworth and Paliwal, 1984)

typical set of responses obtained from listening to glide/liquid-vowel synthetic stimuli (simplified)

3160 Hz	w	w	w	l	l	l	l	j	j	j	
↑	w	w	w	l	l	l	l	j	j	j	
F3 locus freq.	w	w	w	r	r	r	r	l	j	j	
↓	w	w	w	r	r	r	r	j	j	j	
1540 Hz	w	w	r	r	r	r	r	j	j	j	
760 Hz	←		F2 locus freq.						→		2380 Hz

Sonorant Consonants Acoustically

Lehiste (1964): F1 and F2 of [l] and [w] coincide to a large extent. F2 for [w] is somewhat lower than F2 of [l]. F2 of [j] is somewhat higher than F2 of [l].

Conclusion

From an acoustic point of view, liquid-glide alternations can be described as minimal changes from the target segment

Obviously, phonology needs the phonetic information to explain this process as an unmarked (widely attested) one

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Third Process: Rhythmic Variability

- Topic: Rate adjustments: compression or restructuring?
- Experiment: Eliciting fast speech
Phonetic evidence?

Language: Re-/misinterpretation of rhythm in accelerated or sloppy speaking


Data



type 1: *stú die tòe la ge* → *stú die toe là ge*
'study grant'  

Rightward Stress Shift

Language: Re-/misinterpretation of rhythm in accelerated or sloppy speaking

Data


type 1: *stú die tòe la ge* → *stú die toe là ge*
'study grant' 


type 2: *per fèc tio níst* → *pèr fec tio níst*
 

Leftward Stress Shift

Language: Re-/misinterpretation of rhythm in accelerated or sloppy speaking

Data

type 1: *stú die tòe la ge* → *stú die toe là ge*
'study grant' 

type 2: *per fèc tio níst* → *pèr fec tio níst*


type 3: *zùid à fri káans* → *zùid a fri káans*
'south african' 

Beat Reduction

Observation

There are different grammars for different rates and styles of speaking

Phonetic Compression is not the sole explanation

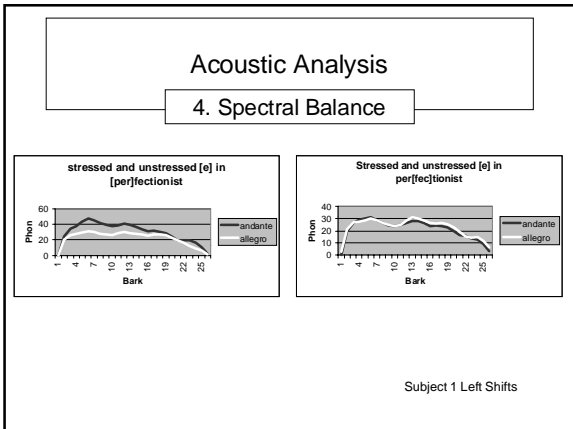
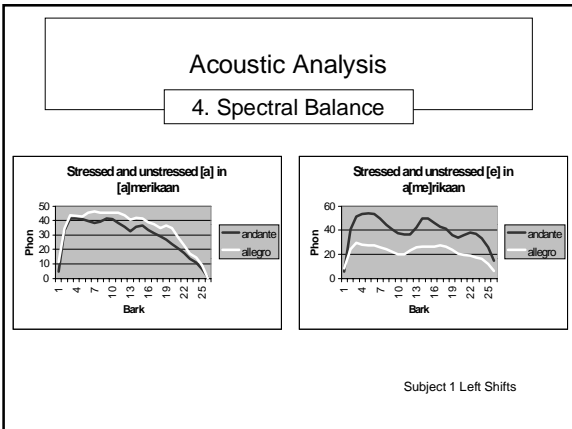
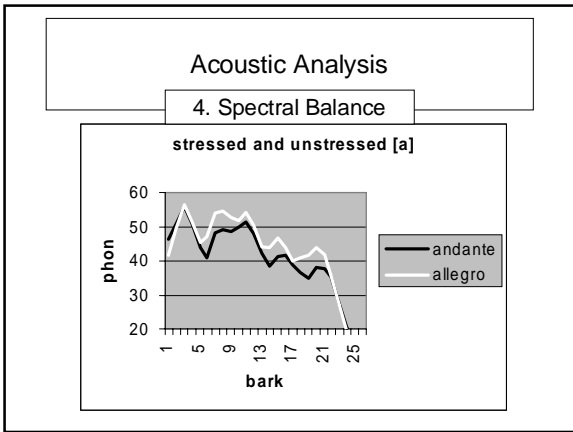
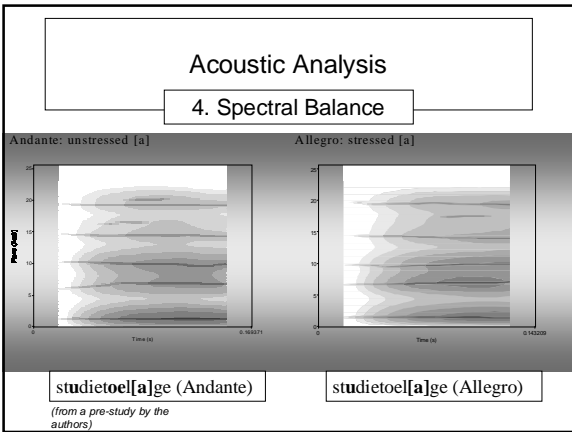
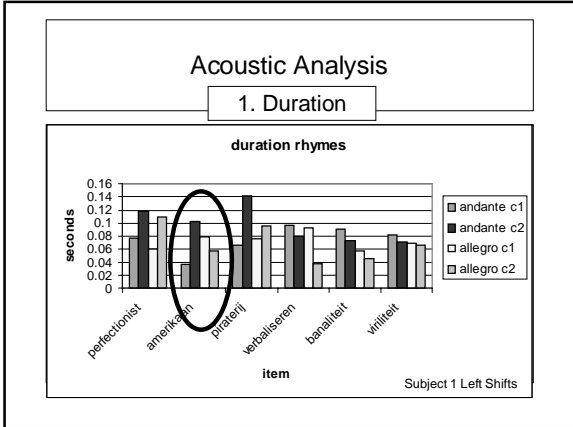
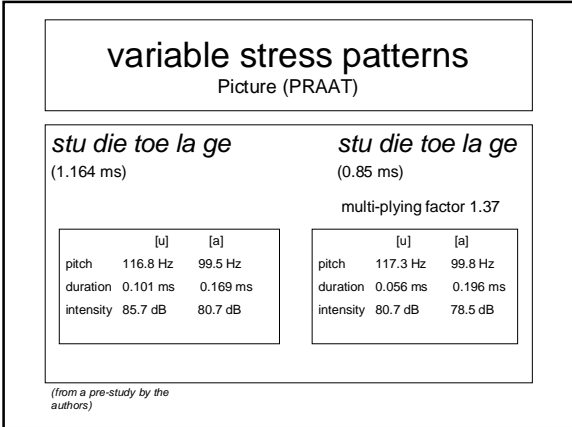
In fast speech it is more important to avoid clashes.

Phonetic Evidence?

Is there phonetic evidence for rhythmic restructuring in allegro speech?

Stress Correlates:

1. Duration
2. Pitch
3. Intensity
4. Spectral Balance (Sluiter, 1995)
5. Rhythm Factors (Quené & Port, 2002 a.o.)



Acoustic Analysis

5. Rhythm Factors

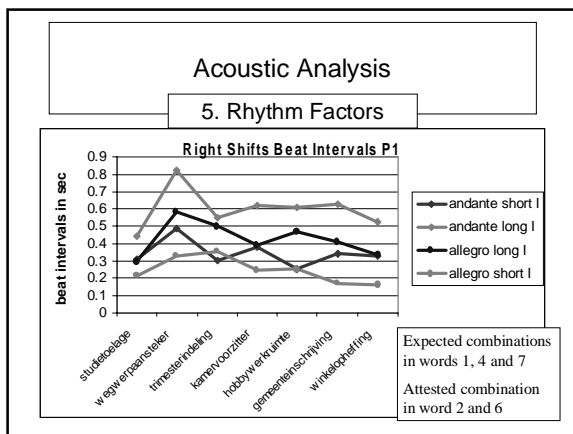
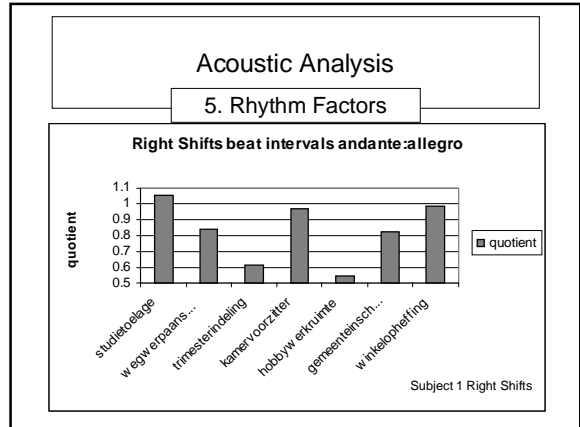
Equal Spacing Constraint:

Prominent vowel onsets are attracted to periodically spaced temporal locations

(Couper-Kuhlen 1993; Cummins & Port 1998; Quené & Port 2002)

studietoelage (Andante): 0.358 sec
 studietoelage (Allegro): 0.328 sec factor: 1.091

(from a pre-study by the authors)



Conclusion

- The rhythmic differences as a result of different speech rates could not be demonstrated acoustically
- A systematic correlate of secondary stress still needs to be found
- Apparently, not all phonological processes can be tested empirically by phonetic analysis