

**INTERSEGMENTAL CO-ORDINATION**

All segments of a multisegmental utterance of continuous speech have contextual neighbours.

In all cases, the articulatory events that make up the segment concerned have to be co-ordinated with those of the neighbouring context.

Three types of co-ordinatory relationship with the context will be discussed:

1. devoicing
2. aspiration
3. preaspiration

**1. THE DEVOICING PROCESS**

The timing of voicing relative to that of articulatory events, *as a reflection of the interplay between contextual factors and options of phonetic control*, is an example of INTERSEGMENTAL CO-ORDINATION.

NOTE: The control of the phonatory system is physiologically independent of articulation → therefore segments can vary in the timing of onset or offset of a given phonatory state.

Thus voicing can be described either as starting late or ending early *in relation to the supralaryngeal articulatory event of a segment*.

A segment can be *partially devoiced*



- a. initially devoiced (voicing starts late)
- b. finally devoiced (voicing ends early)

Languages differ in the co-ordination of articulatory and phonatory timing.
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Study *Figure 12.1* on pp. 340-341.

It is important to locate the medial phase of segments because *one segment's offset transition overlaps with the onset of the next segment*.

There are clear-cut articulatory and auditory criteria for locating the boundaries of the *medial phase* for stops and fricatives:

- a. STOPS: the medial phase lasts from the first to the last instant of complete closure
- b. FRICATIVES: the medial phase lasts from the first to the last instant of close approximation and audible friction.

It is, however, not easy to identify the medial phase of approximants and vowels (=vocoids): the vocal organs tend to pass through the articulatory target as it is identified by phonetic labels.

A stop or a fricative is fully voiced if *the voicing is evident throughout the medial phase of the segment*.

Thus devoicing has to involve an *absence of voicing during some part of the medial phase*.

Problem: When devoicing results in voicelessness throughout the entire medial phase (=fully devoiced segment), how should it be transcribed?

Is [z̥] identical with [s]? Or should [z̥] be classified as a separate type of segment from [s]?

Even though from the *phonetic perspective* these two segments are identical, there are three arguments for *not* transcribing them as [s].

Argument #1:

There is a phonological basis for identifying the segment as being devoiced, i.e. as having lost 'voicing' that belongs to the segment.

Argument #2:

Different degrees of muscular effort (fortis vs. lenis articulations);  
voiced (lenis) → voiceless (fortis): in addition to the state of the vocal folds, the overall muscular tension also has to be considered → two different segments!

(But: the fortis/lenis distinction needs more empirical confirmation!)

Argument #3:

Phonatory state: the devoiced segment in question may not be articulated with a fully open glottis. The vocal folds may be positioned in the state of whisper (the vocal folds are close enough to create turbulence even though they are apart, resulting in audible friction).

It is not unusual to substitute a whispered phonation for a voiced one during the devoicing process, rather than substituting full voicelessness. Example: *zeal* [z̥] in a whispered phonation will remain distinguishable from *seal* [s].

SUMMARY:

Devoicing can be (a) partial or (b) full.

*Partial devoicing* displays whisper of voicelessness at the beginning of the medial phase (*initial devoicing*) or at the end of the medial phase (*final devoicing*).

*Full devoicing*: the entire medial phase is characterized by whisper of voicelessness.

### DEVOICING AS AN ALLOPHONIC PROCESS

Languages differ in

- (a) the degree of devoicing
- (b) glottal adjustment

Compare English and French! (p. 345)

When a voiced consonant is next to a voiceless one, devoicing may take place → this is a very common allophonic process in many languages.

Study the examples from Russian and Arabic, (p. 346)

Devoicing may result from a phonologically conditioned reduction process; e.g. in Greek (p. 346, 347)

NOTE: the position in the phrase, and the intonational context may block the allophonic process!

Portuguese (Lisbon accent): devoicing of consonants and the high vowels in pre-pausal syllables (p. 347)

Japanese: devoicing of vowel phonemes

Study the examples on p. 347.

NOTE: allophonic devoicing may be a source of historical change → the devoiced vowel has dropped in some Japanese dialects (p. 348)

## 2. ASPIRATION

ASPIRATION IS A FEATURE WHICH CAN MANIFEST A CO-ORDINATORY RELATIONSHIP BETWEEN A VOICELESS SEGMENT AND A FOLLOWING SEGMENT AT THE LEADING EDGE OF A SYLLABLE.

In aspiration, the onset of voicing for the second of the two segments is *delayed* for an audible period of 30-40 msec or more *beyond the end of the medial phase of the first segment!*

The onset of the second segment can be phonated as *whisper* or *voicelessness* → thus the term *Voice Onset Delay* or *Voice Onset Time* is used for aspiration.

Three approaches to the transcription of aspiration:

(i)

ASPIRATION IS A PROPERTY OF THE RELATIONSHIP BETWEEN TWO SEGMENTS -- A VOICELESS SEGMENT FOLLOWED BY A VOICED ONE!

What is the difference between the two transcriptions [p<sup>h</sup>at] and [phat]? (p. 348)

(ii)

The auditory quality of the aspiration is strongly coloured by the articulatory quality of the second segment: the relevant articulators are in position for the articulation of the second segment.

Explain the following transcription:

[p<sup>h</sup>at] (p. 349)

(iii)

The aspirated relationship could be represented by a subscript symbol, indicating *initial devoicing* of the vowel.

Explain the following transcription:

[p<sub>0</sub>at]

The continuum of possible relative timing relationships:

*early onset of voicing* (the beginning of voicing precedes the release by more than 25 msec)

*simultaneous onset of voicing* (the onset of voicing falls within +/-20 msec of the stop release)

*late onset of voicing* (the relative delay in the onset of voicing is more than 25 msec)

ONLY THE LAST ONE QUALIFIES AS ASPIRATION!

Phonemic contrasts between unaspirated and aspirated voiceless stops occurs in many languages.

Study the Chinese and the Thai examples! (pp. 349, 350)

The relationship of aspiration involves a hierarchical ordering of the two segments:

THE SECOND SEGMENT IS OF A MORE OPEN DEGREE OF  
STRICTURE THAN THE FIRST.

Three general cases:

- (i) voiceless stop + vowel  
Study the examples from Swahili, Sutu, Ndaou and English! (pp. 350-351)
- (ii) voiceless stop + approximants  
e.g. English (p. 351)
- (iii) voiceless fricative + vowel  
e.g. Burmese (p. 351)

Voice Onset Time may depend on several factors:

- (i) place of articulation (p. 352)
- (ii) language-specific differences (Study *Figure 12.2*)
- (iii) the type of vowel that follows voiceless stops: longer VOT before close vowels! (p. 353)
- (iv) dialect differences (e.g. Chengtu vs. Beijing accents, p. 353)

With aspiration it is possible to achieve triple distinction: contrast between unaspirated, moderately aspirated and strongly aspirated segments.

(e.g. Korean, p. 353)

In such cases, however, more phonetic factors may be relevant than just the difference in VOT -- p. 353.

#### VOICED ASPIRATION

A syllable initial voiced stop (or a fricative or a lateral liquid) may be pronounced with a whispery or breathy phonation instead of modal voicing.
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Transcription practices:

- a. [b<sup>h</sup> ar] or [b<sup>ɦ</sup> ar] *outside*      [b ar] *twelve*

[<sup>h</sup>] -- indicates whispery voice

- b. [b̤ar]-- indicates different modes of phonation (the syllable starts with whispery or breathy phonation, changing to voiced phonation)

- c. [b̥ ar] -- indicates that the whispery phonation fades away before the end of the vowel

- d. [b̤̥ ar] -- indicates the *higher airflow* that is associated with breathy voice.

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Aspiration vs. voiced aspiration: contrastive use → linguistic function!

Examples: pp. 354-5.

A special category of voiced aspiration: voiceless stops released with breathy or whispery voice. (p. 355)

#### THE UNIFICATION OF VOICELESS AND VOICED ASPIRATION

Are they instances of the same phenomenon?

Catford (1977) proposes a unifying phonetic definition:

ASPIRATION INVOLVES DELAY IN THE ONSET OF NORMAL VOICING
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*Both* voiceless and voiced aspiration meet this condition -- study pp. 355!

## ASPIRATION VERSUS FINAL RELEASE

The transcription of [it<sup>h</sup>] *eat* is misleading! Explain! (p. 355)

*Aspiration*: a co-ordinatory relationship between a stop and a following voiced segment

*Final release*: a co-ordinatory relationship between a stop and utterance-final silence

### PREASPIRATION

Preaspiration involves early offset of normal voicing in the syllable-nuclear voiced segment, anticipating the voicelessness of the syllable-final voiceless segment.

Transcription options:

1. [a̤k]
2. [a<sup>h</sup>k] or [ahk]
3. [a<sup>̚</sup>k]

Example: p. 356.

*voice-offset time*: “the time lapse between the offset of voicing related to a prestop sonorant sound and the beginning of the silent interval related to stop closure” (Engstrand 1987)

Phonetic realizations of preaspiration: Study p. 357.

Icelandic: contrast between pre-aspirated and aspirated stops (p. 358)

Phonation characteristics: voiced phonation



(whisper phonation) may occur during  
the transition from voiced to  
voiceless states



voiceless state

Preaspiration in the Andalusian accent of Spanish (p.358)



