

Recursive Patterns in Phonological Phrases

Maartje Schreuder & Dicky Gilbers

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M.J.Schreuder & D.G.Gilbers
University of Groningen
Department of Linguistics
P.O. Box 716
9700 AS Groningen
The Netherlands
M.J.Schreuder@let.rug.nl
<http://www.let.rug.nl/~schreudr/papers.htm>

Recursive Patterns in Phonological Phrases

Question:

Recursion in phonological phrases?

↳ Recursive application of edge-marking processes such as **early pitch accent placement**?

Syntactic recursion

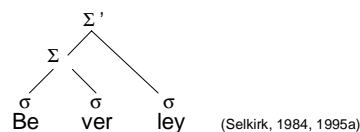
Syntax:

- Recursive rules are capable of repeated application in generating a sentence
- An infinite set of sentences can be generated from a finite set of rules

Phonological recursion is limited

Phonology:

- Iterative rule application is limited
- But: *super-foot* → dactylic patterns



(Selkirk, 1984, 1995a)

(non-recursive alternatives are proposed: Dresher and Lahiri 1991, Kager 1994)

Strict Layer Hypothesis

Strict Layer Hypothesis (Selkirk 1984)

- a prosodic category of one level is exhaustively parsed into constituents of the next-lower level;
- those next-lower level constituents are all of the same type
- **prosodic structure is not recursive**
- mismatch between syntactically recursive constituent structure and the linearly segmented structure in prosody

Criticism on Strict Layer Hypothesis

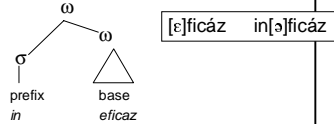
The assumption of non-recursivity in the SLH has been challenged:

- prosodic words with affixal clitics, (Itô & Mester 1992), (Zec & Inkelas 1991), (Vigário 1999) a.o.;
- intonational phrase (see Ladd (1986, 1992), and references therein).

Criticism on Strict Layer Hypothesis

The assumption of non-recursivity in the SLH has been challenged:

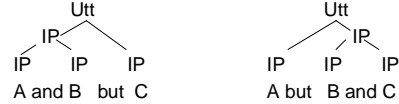
- Vowel Reduction blocking PWD with prefix in European Portuguese (Vigário, 1999):



Criticism on Strict Layer Hypothesis

The assumption of non-recursivity in the SLH has been challenged:

- intonational phrase (see Ladd (1986, 1992):



Criticism on Strict Layer Hypothesis

Replaced with four separate constraints (Selkirk 1995b):

- **Layeredness:** No C^i dominates a C^j , $j = i$
e.g. "No σ dominates a Ft."
- **Headedness:** Any C^i must dominate a C^{i+1} (except if $C^i = \sigma$)
e.g. "A PWD must dominate a Ft."
- **Exhaustivity:** No C^i immediately dominates a constituent C^j , $j < i-1$
e.g. "No PWD immediately dominates a σ "
- **Nonrecursivity:** No C_i dominates C_j , $j = i$
e.g. "No Ft dominates a Ft"

Exhaustivity and Nonrecursivity are violable

Recursive edge-marking processes

Syntax:

[voormalig [onafhankelijk [Amsterdams [aardrijkskundig genootschap]_{NP}]_{NP}]_{NP}]_{NP}

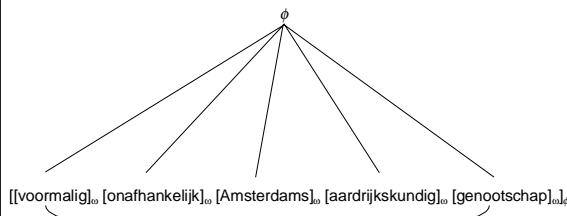
'Previously independent Amsterdam geographical society'

Phonology:

Recursive early pitch accent placement?

Prosodic structure

- Phonology:
linear (non-recursive) structure:



Prosodic structure

- Phonology:
or recursive structure:



Data

(Amsterdams) aardrijkskundig genóotschap
'(Amsterdam) geographical society'

(internationale) diplomatieke organisaties
'(international) diplomatic organizations'

(algemene) regionale dágbladpers
'(general) regional day-paper press'

(progressieve) socialistische partij
'(progressive) socialist party'

(academisch) psychiatrisch ziekenhuis
'(academic) psychiatric hospital'

(A = main stress position, A = early pitch accent position)

Experiment design

Map task

Experiment design

Maps:

- 50 different maps
- 1 syntactically recursive phrase landmark [Adj [Adj Noun] and 1 non-recursive, non-corresponding phrase landmark [Adj Noun]
- 100 phrases in total
- experimenter's map: only the starting point
- about 550 spoken phrases in total

Subjects:

- 24 Dutch subjects
- 10 men, 14 women
- aged 19 to 28

Results

Amsterdams aardrijkskundig genóotschap
'(Amsterdam) geographical society'

internationale diplomatieke organisaties
'(international) diplomatic organizations'

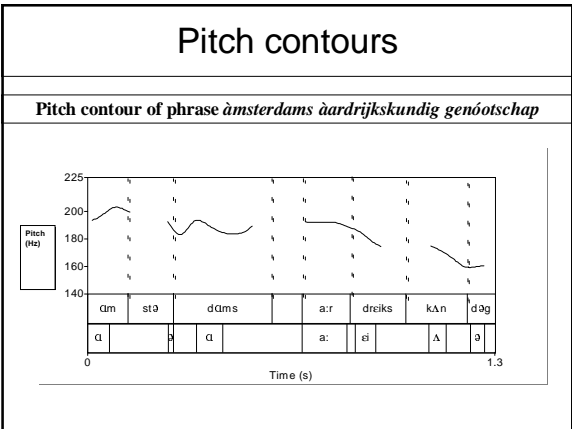
algemene regionale dágbladpers
'(general) regional day-paper press'

progressieve socialistische partij
'(progressive) socialist party'

academisch psychiatrisch ziekenhuis
'(academic) psychiatric hospital'

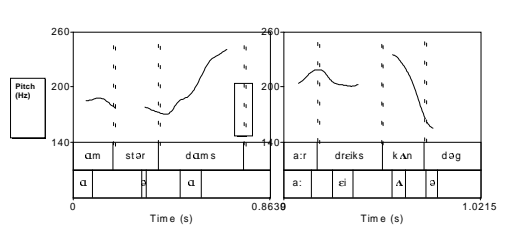
Auditory analysis

- 3 trained listeners
- place of word accent on adjectives
- words could be double pitch accented
- majority judgement
- consensus among the listeners
- Chi-Square tests



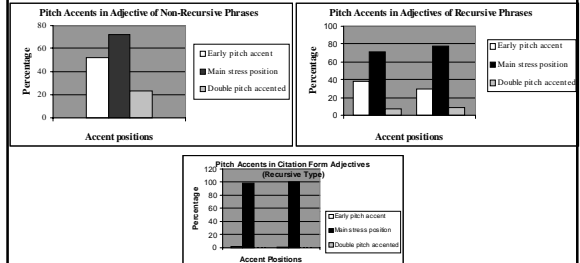
Pitch contours

Pitch contours of the words *amsterdams* and *aardrijkskundig* in citation form



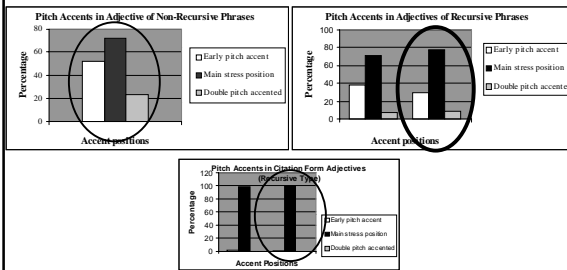
Results

Percentages of perceived pitch accents



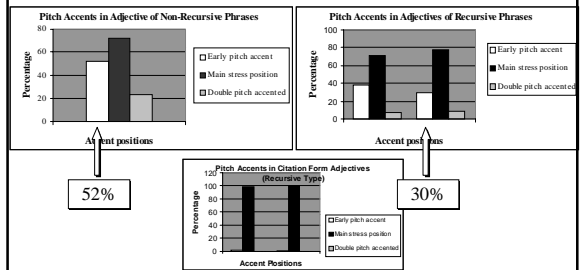
Results

Percentages of perceived pitch accents



Results

Percentages of perceived pitch accents



Results

- Strong preference to accent the **main stress** syllable
- **Early accent placement** is also a strong tendency
- Non-recursive phrases: 52% early pitch accent
- **Recursive phrases**: 30% early pitch accent on A2
- Citation form: ~ 100% main stress position
- **The results confirm our hypothesis that these syntactically recursive phrases can also be recursive prosodically.**

Results

- **Pearson Chi-Square tests:**
 - proportions early pitch accents / main stress positions in **phrase vs. citation form**: significantly different (χ^2 (df 1) = 122.524, $p < 0.001$).
 - proportions of **non-recursive vs. recursive** phrases (corresponding adjectives): significantly different (χ^2 (df 1) = 12.326, $p < 0.001$).
- Chi-Square values: **non-recursive vs. recursive < phrase vs. citation form**
- Large standard deviations subjects and items

Results

Another interesting finding:

- Relatively high percentages of **double pitch accents**
i.e., both the early syllable and the main stress position of the adjective got a pitch accent
- Shattuck-Hufnagel reports a similar finding (2000).
- Evidence: Phrasal Rule \neq stress shift, but an additional pitch accent, which can cause the main stress position to get deaccented

Discussion

- The prosodic recursion-**hypothesis** holds: **recursion** does exist in prosody.
- But: **Optionality**. The maximal phonological phrases are early accented significantly more often than the embedded phonological phrases.
- Recursive structure optional? Early pitch accent placement optional? Both optional?
- No one-to-one mapping from **syntax** to **prosody**, because optionality in syntactic structure would not be an option.

Conclusion

- Results: prosodic structure is **less linear** than assumed in the Strict Layer Hypothesis and derived hypotheses
- In 30% of our data, A2 in syntactically recursive NP received an **early pitch accent**
- Conclusion: these phrases are **recursive prosodically** as well

Evidence for a more prominent place for recursion in phonology