Rhythmic phrasing of prosodic words: a diachronic perspective from Old English, supported by experimental evidence from German

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NELS 50
Overview

- The phrasing of prosodic words:
  - via syntax-prosody correspondence
  - via rhythmic principles
- The syntax-prosody interface in Lexical-Functional Grammar
- Evidence from the ge-prefix:
  - A corpus study of Old English: orthographic association of the ge-prefix
  - An experimental study of the ge-prefix in Modern German
- Analysis at the syntax-prosody interface
- Conclusion
Reflections on the syntax-prosody interface

- Starting point: prosodic constituent structure reflects syntactic constituent structure to a large extent (a.o., Selkirk 1986, Nespor and Vogel 1986, Selkirk 2011)

  \[\Rightarrow\] e.g., *Match* (Selkirk 2011) proposes that
  - a syntactic clause corresponds to an intonational phrase (ι)
  - a syntactic phrase corresponds to a phonological phrase (ϕ)
  - a syntactic word corresponds to a prosodic word (ω)


  \[\Rightarrow\] Especially with respect to the difference between function words and lexical words (a.o., Truckenbrodt (1999), Selkirk (1995))

  \[\Rightarrow\] Assumption of an independent prosodic structure with several influencing factors – among them: syntactic structure (e.g., Shattuck-Hufnagel and Turk (1996), Beckmann (1996))
Prosodic words at the prosody-syntax interface

Rhythmic organisation of prosodic structure

Prosodic phrasing in Germanic languages:

→ ‘leftwards’ oriented enclitisisation of function words regardless of syntactic constituency
→ supports independent prosodic structure, which can be influenced by, but is often independent of syntactic structure
→ trochaic foot as the fundamental driving force, also across word boundaries (Abercrombie (1964), see also Cutler (1996))
⇒ Is prosodic structure determined by rhythmic principles? (a.o., Sweet (1885), Sievers (1901), Lahiri and Plank (2010))
Elusive definition – some assumptions:

a) Lexical words form prosodic words, functional words don’t - except if they are placed at the initial or final position of an intonational phrase (see discussion in Shattuck-Hufnagel and Turk (1996), also work on Swabian pronouns (Bögel 2015))

b) Possible acoustic indication: increased closure duration of stops in word-initial position (Cooper 1991)

c) Prosodic words can be larger or smaller than lexical words

d) Based on foot structure: “minimally a stressed foot [...] and maximally a single lexical word combined with any associated unstressed function words” (Wheeldon 2000)
The rhythmic phrasing of prosodic words

Unclear: whether a prosodic word can be ‘split’ between two lexical words

→ Predicted by rhythmic phrasing ... 

    morphosyntactic phrasing:  \( \ddot{x} \) [ \( \times \dddot{x} \times \) ]
    prosodic phrasing:  \( \dddot{x} \times \) ( \( \dddot{x} \times \) )

→ ... and found in the literature

    Abercrombie (1964): \textit{Know then thy|self, presume not} | \textit{God to|scan}
    Sweet (1904): \[\textit{aimē freid}] (‘I’m afraid’)

Lexical-Functional Grammar

- LFG has a projection architecture.
  - different levels of representation related to each other via mathematically defined projections.

- Two syntactic representations
  - c(onstituent)-structure: represents linear order, hierarchical relationships and constituency
  - f(unctional)-structure: represents basic predicate-argument relations and functional information

- LFG follows the lexicalist hypothesis:
  - only morphologically complete words enter the syntactic tree

- Over the years, more projections have been argued for, among them s(emantic)-, i(nformation)-, and p(rosodic)-structure

- LFG architecture allows for complex interactions across these projections.
At the syntax-prosody interface

Two perspectives:
(Roughly following models as proposed by, a.o., Levelt (1999) and Jackendoff (2002)

- **Production**: from meaning to form (syntax → prosody)
- **Comprehension**: from form to meaning (prosody → syntax)

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**Production**

<table>
<thead>
<tr>
<th>Production</th>
<th>Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>c-structure</td>
<td>Lexicon</td>
</tr>
<tr>
<td>↓</td>
<td>^</td>
</tr>
<tr>
<td>p-structure</td>
<td></td>
</tr>
</tbody>
</table>

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**Comprehension**

- The *Transfer of structure* → Information on syntactic and prosodic phrasing, and on intonation is exchanged
- The *Transfer of vocabulary* → Associates morphosyntactic and phonological information on lexical elements and projects them to their respective structures
**P-structure – the p-diagram (during production!)**

- Linear representation in the p-diagram
  - structured syllablewise
  - Each syllable is part of a vector associating the syllable with relevant values:
    - *lexical stress, segments, prosodic phrasing, ...*
  - Includes language-specific phonological processes (postlexical phonology, prosodic restructuring)

<table>
<thead>
<tr>
<th>PHRASING</th>
<th>...</th>
<th>σ</th>
<th>σ</th>
<th>σ</th>
<th>σ _ν</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEX_STRESS</td>
<td>...</td>
<td>prim</td>
<td>–</td>
<td>prim</td>
<td>–</td>
</tr>
<tr>
<td>SEGMENTS</td>
<td>...</td>
<td>/bal/</td>
<td>/gə/</td>
<td>/treː/</td>
<td>/t̠ə/</td>
</tr>
<tr>
<td>V. INDEX</td>
<td>...</td>
<td>S_2</td>
<td>S_3</td>
<td>S_4</td>
<td>S_5</td>
</tr>
</tbody>
</table>

- Input to the p-diagram comes from c-structure (*Transfer of structure*) and the lexicon (*Transfer of vocabulary*)
## The Transfer of Vocabulary

- Associates morphosyntactic and phonological information on lexical elements
  - Via the multidimensional lexicon: projects them to their respective structures

### Table: Lexical Transfer

<table>
<thead>
<tr>
<th>Syntactic Form</th>
<th>Phonological Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>getreten</strong> V</td>
<td></td>
</tr>
<tr>
<td>(↑ PRED) = ‘treten⟨SUBJ, OBJ⟩’</td>
<td></td>
</tr>
<tr>
<td>(↑ TENSE) = pres</td>
<td></td>
</tr>
<tr>
<td>(↑ VFORM) = ppast</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td><strong>Ball</strong> N</td>
<td></td>
</tr>
<tr>
<td>(↑ PRED) = ‘Ball’</td>
<td></td>
</tr>
<tr>
<td>(↑ PERS) = 3</td>
<td></td>
</tr>
<tr>
<td>(↑ NUM) = sg</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
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<tr>
<td><strong>getreten</strong> V</td>
<td></td>
</tr>
<tr>
<td>P-FORM [gətretn]</td>
<td></td>
</tr>
<tr>
<td>SEGMENTS /gətrɛtn/</td>
<td></td>
</tr>
<tr>
<td>METR. FRAME σ'σσ</td>
<td></td>
</tr>
<tr>
<td><strong>Ball</strong> N</td>
<td></td>
</tr>
<tr>
<td>P-FORM [bal]</td>
<td></td>
</tr>
<tr>
<td>SEGMENTS /bəl/</td>
<td></td>
</tr>
<tr>
<td>METR. FRAME 'σ</td>
<td></td>
</tr>
</tbody>
</table>

- Each lexical dimension can only be accessed by the related module
  - Modular: strict separation of module-related information
  - Translation function: Once a dimension is triggered, the related dimensions can be accessed as well.
  - Associated **p-form is selected and made available to p-structure.**
### The Transfer of Vocabulary II

#### p(honological)-form

<table>
<thead>
<tr>
<th>P-FORM</th>
<th>[ɡətretn]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEGMENTS</td>
<td>/ɡətretn/</td>
</tr>
<tr>
<td>METR. FRAME</td>
<td>σ'σσ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P-FORM</th>
<th>[bal]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEGMENTS</td>
<td>/bəl/</td>
</tr>
<tr>
<td>METR. FRAME</td>
<td>'σ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PHRASING</th>
<th>...</th>
<th>σ</th>
<th>σ</th>
<th>σ</th>
<th>σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEX_STRESS</td>
<td>...</td>
<td>prim</td>
<td>–</td>
<td>prim</td>
<td>–</td>
</tr>
<tr>
<td>SEGMENTS</td>
<td>...</td>
<td>/bal/</td>
<td>/ɡə/</td>
<td>/tre:/</td>
<td>/tn/</td>
</tr>
<tr>
<td>V. INDEX</td>
<td>...</td>
<td>S₂</td>
<td>S₃</td>
<td>S₄</td>
<td>S₅</td>
</tr>
</tbody>
</table>

- Also needed: Information on larger prosodic constituents
  - Via the transfer of structure
The Transfer of Structure ... from syntax to prosody

\[
\begin{align*}
S/IP/CP & \quad (\uparrow(T(\ast))) \quad S_{\text{min}} \quad \text{PHRASING} = \iota(\quad \\
(\uparrow(T(\ast))) \quad S_{\text{max}} \quad \text{PHRASING} = )_\iota
\end{align*}
\]

\[
\begin{array}{cccccc}
\text{PHRASING} & \iota( & \ldots & \sigma & \sigma & \sigma & \sigma)_\iota \\
\hline
\text{LEX-STRESS} & \ldots & \text{prim} & - & \text{prim} & - \\
\text{SEGMENTS} & \ldots & /\text{bal}/ & /\text{g}\varepsilon/ & /\text{tre}/ & /\text{t}\eta/ \\
\hline
\text{VECTORINDEX} & \ldots & S_2 & S_3 & S_4 & S_{\text{max}}
\end{array}
\]

- where \( S_{\text{min}} \) refers to the \textit{first} syllable within the scope of a node
- where \( S_{\text{max}} \) refers to the \textit{last} syllable within the scope of a node

→ Roughly following Selkirk (2011)'s \textit{Match theory}
... and the prosodic word?

Two options:

1. The prosodic word can be projected during the *transfer of structure* from a terminal node in the syntactic tree

2. The prosodic word can be indicated in the lexical entry as part of the metrical frame and be projected during the *transfer of vocabulary*

→ Second option is assumed (see Bögel (2015) for a discussion)
Overall syntax-prosody interface

**c-structure/syntax:**

\[
\begin{align*}
S/IP/CP \\
(\tau(T(*) ) \ S_{\min} \ \text{PHRASING}) &= (\iota) \\
(\tau(T(*) ) \ S_{\max} \ \text{PHRASING}) &= (\iota)
\end{align*}
\]

**s-form** | **p-form**
---|---
getreten V | P-FORM
| [gətretn]
| SEGMENTS
| /gətretn/
| METR. FRAME
| \((\sigma'\sigma)_{\omega}\)

Ball N | P-FORM
| [bal]
| SEGMENTS
| /bəl/
| METR. FRAME
| \((\sigma)_{\omega}\)

**p-structure:**

<table>
<thead>
<tr>
<th>PHRASING</th>
<th>((\ldots (\sigma)<em>{\omega} (\sigma \sigma \sigma)</em>{\omega})_{\iota})</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEX_STR.</td>
<td>((\ldots \text{prim} - \text{prim} -))</td>
</tr>
<tr>
<td>SEGMENTS</td>
<td>((/\text{bal}/ /\text{gə}/ /\text{tre}/ /\text{η}/))</td>
</tr>
<tr>
<td>V. INDEX</td>
<td>((\ldots \ S_2 \ S_3 \ S_4 \ S_5))</td>
</tr>
</tbody>
</table>

↓

postlexical phonology

phonetics

(according to individual language constraints)
Rhythmic phrasing

If phrasing according to trochaic feet is assumed:

\[
('\text{Ball}) \ (\text{ge'treten}) \rightarrow ('\text{Ball ge}) ('\text{treten})
\]

Some evidence for rhythmic phrasing:
- Old English orthography
- German experimental data
The *ge*-prefix in Old English

- Pronounced [jə], short form in script: ĝ
- Unstressed (Old English has very regular stem-initial stress)
- Very common across word categories
- In verbs: often participle forms, but not restricted to them. Also: not obligatory.
  - Often indicating resultativity (see McFadden 2015)
- less regular in Middle English (form: *i*-)  
- vanished in Modern English (except for remnants in words like *alike, aware*)
Old English orthography

Word division is less strict:

- Short words often run together
- Compounds are often divided into two parts
- Occasionally, the ge- prefix can be found
  - attaching to previous words
  - detaching from the following stem
  - or both

... and him with gefuhton and hie gefliemdon ...

[Handwritten text]
Are these prosodic reflexes?

Hardly any research on this topic - mentionings in, e.g., Frey (1988), Fleischer (2009), and Parkes (1992)

Historical reasoning:
- Greek and Roman tradition after the first century was the *scriptio continua*
- Written word was a record of the spoken word, texts were read out loud (*elocutio*)
  → **“An early medieval text was always either a program for or a record of the spoken word” (Treitler 1984, 141)**
  → Preparation for a declamation: finding the right spot to take breath, and when to pause to indicate a sense unit
  ⇒ Not far-fetched to assume leftovers of these traditions in the scripts of the Old English period
- Note: variable word division is also found in Old Irish, Old High German, etc.
Corpus study: the Old English *ge*-prefix

Text used: facsimile of the Anglo-Saxon Chronicles (Parker chronicles)
- ‘History’ of England on 62 pages
- Written by single scribe until 891 (then followed by others)
- Ends in 1070

Method:
- Automatic search for *ge*-prefixed verbs and their preceding neighbours in transcription (modern word division, non-tagged)
- Manual search in the facsimile for orthographic varieties
Results

- Total number of ge-prefixed verbs: 457
- Previous word categories: Lexical words: 215; Function words: 236

a) **ge attaching to previous word** (without 7 ‘and’): 104

<table>
<thead>
<tr>
<th></th>
<th>Lexical words</th>
<th>Function words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>18</td>
<td>86</td>
</tr>
<tr>
<td>1 Syll</td>
<td>5</td>
<td>81</td>
</tr>
</tbody>
</table>

→ Given the overall equal distribution of function and lexical words, *ge* seems to prefer to attach to monosyllabic function words

b) **ge not attaching to stem** (without line breaks): 66

c) **ge** not attaching to stem **and** attaching to previous word: 28

⇒ Attachment to previous (function) word → adding prosodic ‘weight’?

⇒ Detachment from following verb stem → indicating the start of a ‘new’ prosodic word?
The ge-prefix in Modern German

- Usage similar to Old English *ge*
- Across word categories
- With a verb mostly in participle constructions
- Unstressed
- Pronounced as a stop [g]
Design of the study:

- Past participle with subject and object: *Johann hat den Ball getreten*
- Object with three conditions:
  - a) Mono-syllabic stressed (X)
  - b) Bi-syllabic stressed - unstressed (X –)
  - c) Bi-Syllabic unstressed - stressed (– X)
- Equal distribution of final codas across the three conditions (stops, vowels, ...)
- Subject always consisted of two, the verb of three syllables

Hypothesis:

→ If *ge* is phrased rhythmically, it is more likely to phrase with conditions a) and c) (forming a trochaic foot)
Experimental production study

- Participants: 5 female speakers from Southern Germany
- Procedure:
  - Recorded in soundproof booth of the phonetic laboratory in Konstanz
  - Read out sentences at ‘natural speed’
- Resulting material: 350 sentences
Results - some tendencies

1. [g] is more likely to be pronounced as [j] if following a stressed syllable ending in a vowel or a liquid

2. [g] is more likely to merge with a preceding plosive if following a stressed syllable
Result - closure duration of [g]

Hypothesis:
The closure duration of [g] is shorter if [gə] is phrased with the previous word; it is longer if phrased with the following stem (indicating the start of a prosodic word)

→ Closure duration was measured using a linear mixed effects regression model with stress patterns as fixed factors and subject and items as random factors

⇒ If [g] followed a stressed syllable (1 or 2-syllabic), the closure duration of [g] was significantly shorter!

- Following (X): $\beta$ -0.0048, SE = 0.002, t= -2.4, $p < 0.05$
- Following (–X): $\beta$ -0.0043, SE = 0.002, t= -2.36, $p < 0.05$

Conclusion: Evidence points towards the phrasing of ge with the previous word if following a stressed syllable
Further directions for experimental evidence

- Closure duration and aspiration of initial verb-stem stops: not controlled for in this experiment, but tendencies
- Investigation of dialectal differences in Germany
  - Southern dialects: vowel elision, or complete deletion of ge-
  - Northern dialects: no vowel elision/deletion, but preference of [j] instead of [g]
Evidence from Old English and Modern German points towards a rhythmic phrasing at the level of the prosodic word

- The matching of syntactic terminal nodes and prosodic words seems to be uncalled for
- Two possibilities:
  a) Include only lefthand prosodic word boundary as part of the lexical entry
     → Allow for p-structure algorithm to provide the closing boundary
  b) Determine phrasing patterns postlexically in p-structure
Problematic: the generalisation of this assumption to all words with non-initial stress

→ A lot more research is needed in this direction!
Thank you!

... questions, comments...?