Vowel hiatus at word boundaries and prosodic structure in Ikpana

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Introduction

Data: vowel hiatus at word boundaries in Ikpana (Logba) ([lgq], Kwa: Niger-Congo (Ghana))

Framework: Match Theory (Selkirk 2011)

Previous assumptions about prosodic structure:

- Prosody is a subcomponent of the phonology module of grammar (PF) (e.g. Gussenhoven 2004, Kula & Bickmore 2015)
- Unlike the rest of phonology, prosody is generated prior to PF:
  - prosodic information is partially listed in the lexicon (e.g. Bennett et al. 2017)
  - the prosodic structure of utterances is generated in the narrow syntax along with the syntactic structure and is| equally ruled by principles (e.g. Richards 2016)
  - prosodic structure is generated at Spell-Out (i.e. on the way from the narrow syntax to PF) (e.g. Selkirk 2011)

Previous arguments on the syntax-phonology interface:

- Direct Reference approaches
  the domains of application of domain-sensitive phonological phenomena are purely constrained by the syntax (e.g. Manzini 1983, Kaisse 1985, Odden 1987, 1990)
- Indirect Reference Approaches
  syntactic structure and properties influence the phonology via prosodic structure, as an intermediate level of representation between the syntactic and phonological modules of grammar (e.g. Selkirk 1986, 2011, Nespor & Vogel 1986, Inkelas 1990)

Proposal: vowel hiatus resolution in Ikpana is sensitive to syntactic context, suggesting that the module in charge of building prosodic structure has access to syntactic information, either directly or indirectly.

Data

Vowel Hiatus at word boundaries in Ikpana:

- Ikpana nouns and verbs are generally vowel-initial and vowel-final, generating underlying hiatus in a variety of syntactic environments :

(1) a-vá_____o-zá__________i-mbi___a-fá-nu
CM-deer 3SG-cook.pst CM-rice CM-house-POSTP
'The deer cooked rice in the house.'

Corpus data:

- Collected in Logba Alakpeti (southeast Volta region, Ghana) in the summer of 2018
- 3 native speakers (2M, 1F)
- 373 single-clause sentences
  - 287 simple transitive constructions
  - 62 focus constructions
  - 24 ditransitive constructions
- **901 tokens** of underlying vowel hiatus at word boundaries (2 to 4 per sentence)
- Sentences were designed to get a full range of vowel contrasts and tonal contrasts at each word boundary

Logistic regression model:

- Fixed factors: $R2=0.93$
  - Vowel quality interactions ($p=6.08^{e-44}$)
  - **Syntactic boundaries ($p=5.93^{e-25}$)**
  - Tonal interactions ($p=0.371$)

Analysis

Vowel hiatus at word boundaries and syntactic structure

- There are clear differences in frequency of vowel reduction at different syntactic boundaries:

		adverb-subject	object-subject	subject-verb	verb-object	verb-adverb	object-adverb	object-object	object-PP
simple transitive	no adjunct			25.0	85.7				
	PP			25.0	20.0				13.3
	adverb			25.0	69.8		41.9		
	fronted adverb	25.0		63.8	68.8				
transitive with fronted object	no adjunct		21.4	100.0					
	adverb		14.3	50.0		85.7			
ditransitive	no adjunct			N/A	91.7			8.3	
	fronted adverb	8.3		0.0	58.3			16.7	

Table 1: Frequency of vowel reduction (in %) per syntactic boundaries and clause types

- It must be the case that different morphosyntactic environments are associated with different processes in the phonology (i.e. vowel reduction vs. no reduction)
- Vowel reduction for vowel hiatus resolution purposes is more likely to occur within phonological phrases (p-phrases) than across phonological phrase boundaries (Selkirk 1978, 1986, Nespor & Vogel 1986).

a Match Theory-based account
(Selkirk 2011)

The Prosodic Hierarchy above the word level

Utterance
|
Intonational Phrase (ι)
|
Phonological Phrase (φ)
|
Phonological Word (ω)

- Match Theory (Selkirk 2011):
  - The phonology indirectly references the syntax by way of Prosodic Structure generated at Spell-Out
  - Prosodic Structure is governed by interface-specific violable constraints, referencing syntax-prosody correspondences
- Interface-specific constraints (Selkirk 2011):
  PROSPROM (XP,φ) – Assign one violation for every prominent (i.e. clause-initial) syntactic phrase XP that does not constitute its own phonological phrase φ.

  MATCH (XP,φ) – Assign one violation for every syntactic phrase XP that does not match a corresponding prosodic constituent φ in phonological representation.

  MATCH (φ,XP) – Assign one violation for every prosodic constituent φ in phonological representation that does not match a corresponding syntactic phrase XP.

  BINMAX (φ,ω) – Assign a violation for every prosodic phrase φ that consist of more than two prosodic words ω.

  ~~BINMIN (φ,ω) – Assign a violation for every prosodic phrase φ that does not minimally consist of two prosodic words ω.~~
- Additional constraint:
  BINMIN (φ,ω-Right) – Assign one violation for every final prosodic phrase in an intonational phrase ι that does not minimally consist of two prosodic words ω.
- Preliminary constraint ranking: BINMIN (R) ≫ PROSPROM ≫ MATCH (XP,Φ), MATCH (Φ,XP), BINMAX ≫ BINMIN

Modeling variation using Maximum Entropy
(Goldwater & Johnson 2003, Hayes & Wilson 2008)

- The amount of variation found in the data can be accounted for using weighted constraints as opposed to ranked constraints (which can only account for categorical alternations).

BINMIN(φ,ω-Right)	**1.35**
PROSPROM(φ)	1.26
MATCH(φ,XP)	0.88
MATCH(XP,φ)	0.10
BINMAX(φ,ω)	0.02
~~BINMIN(φ,ω)~~	0

Table 2: Constraint weights after optimization (MaxEnt)

O S V _	obs.	/ pred.	BINMIN(R) 1.35	PROSPROM 1.26	MATCH (XP, φ) 0.88	MATCH (φ,XP) 0.10	BINMAX (φ,ω) 0.02	
O S V _	0.21	0.15		-1	-1	-3	-1	-2.46
O S / V _	0	0.04	-1	-1		-2		-2.81
☞ **O / S V _**	**0.79**	**0.61**				**-2**		**-0.20**
O / S / V _	0	0.19	-1					-1.35

Table 3: Example harmonic tableau for object focus constructions

Theoretical Implications

The nature and locus of prosody

- Prosody and syntax are intricately linked.
- If prosodic structure is generated at PF, then PF must have access to more syntactic information than is commonly assumed.
- Otherwise, prosody must be built either in the syntax proper or at Spell-Out (Selkirk 2011).
- If prosody is built in the syntax proper, it must be governed by principles (e.g. unviolable constraints) (Richards 2016).

Vowel hiatus resolution and prosody

- The data from Ikpana presented here shows that vowel hiatus resolution is sensitive to syntactic/prosodic structure.
- Different syntactic (or prosodic) environments yield different vowel hiatus resolution strategies.
- The data from Ikpana discussed here supports findings by Selkirk 1978, 1986, and Nespor & Vogel 1986.

Remaining Questions and Further Research

What happens at PF?

- How does the vowel quality of each vowel in the hiatus context affect vowel reduction?
- How does the tone associated with each vowel (TBU) affect vowel reduction?
- Which vowel gets reduced and why?

Vowel Reduction: a gradient phenomenon

- What does a further analysis of the amount of reduction at different boundaries tell us about the relationship between prosody and hiatus resolution?

Hiatus resolution and prosodic boundaries elsewhere

- Does vowel hiatus resolution at other boundaries confirm the present findings? (i.e. DP-internally, at clause boundaries)
- The list of constructions under study here is not exhaustive. What happens in other constructions? With more adjuncts?

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