

Stress-timed = word-based?

Testing a hypothesis in prosodic typology

René Schiering

Institut für Allgemeine Sprachwissenschaft
Westfälische Wilhelms-Universität Münster

Introduction: Original definitions

- Stress-timed: feet isochronous, syllables variable

F			F		F		F
'σ	σ	σ	'σ	σ	'σ	'σ	

- Syllable-timed: feet variable, syllables isochronous

F			F		F		
σ	σ	'σ	σ	'σ	σ	σ	'σ

- Mora-timed: morae isochronous, segments variable

μ	μ	μ	μ	μ	μ	μ		
C _{-voice}	N ₋	V	C	V _o	C	V	C C	V

Introduction: Deconstructing isochrony

- Instrumental measurements of feet, syllables, and morae do not support this typology
(cf. Beckman 1982, Roach 1982, Dauer 1983, 1987, Auer & Uhmann 1988, Bertinetto 1989)
- However, cross-linguistic, rhythmic differences are perceptually real
(cf. Lehiste 1977, Donovan & Darwin 1979, Miller 1984, Couper-Kuhlen 1993)
- Evidence from language production, processing and acquisition hints at their psycholinguistic reality
(cf. Cutler 1980, 1999, Cutler & Mehler 1993, Nespors, Guasti & Christophe 1996, Ramus, Nespors & Mehler 1999)

Introduction: What underlies the distinctions?

- Clusters of phonological features:

Stress-timed	Syllable-timed
Vowel reduction	No vowel reduction
Complex syllable structure	Simple syllable structure
etc...	etc...

(cf. Bertinetto 1977, Roach 1982, Dauer 1983, Auer 1993, 2001, Dufter 2003)

Introduction: What underlies the distinctions?

- Differences in prosodic domain structure:

Stress-timed	Syllable-timed
P	P
ω	ω
F	F
σ	σ

P = Phonological Phrase, ω = Phonological Word,

F = Foot, σ = Syllable

(cf. Auer 1993, Kleinhenz 1996, Auer 2001, Dufter 2003)

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Stress-timed	Syllable-timed
<p style="text-align: center;">P ω F σ</p>	<p style="text-align: center;">P ω F σ</p>

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(cf. Auer 1993, Kleinhenz 1996, Auer 2001, Dufter 2003)

Introduction: Auer's (1993) typology

Word-language	Syllable-language
reduction of non-accented syllables	no accent-dependent reduction
no [±long] in non-accented syllables	[±long] in all syllables possible
no tone (or restricted)	tone possible
complex syllable structure	simple syllable structure
frequent assimilations, dissimilations	few assimilations
syllable division ambiguous/variable	syllable division unambiguous
word-related phonological processes	no word-related processes
external ≠ internal sandhi	external = internal sandhi
no vowel harmony	vowel harmony possible
phonetically strong word accent	phonetically weak or no accent at all
free or grammatical word accent	word accent fixed
no geminates	geminates possible
central vowel phonemes possible	no central ("reduced") vowels

Hypotheses for prosodic typology

- Do phonological properties cluster in the predicted ways in the different rhythm classes?
 - Auer (1993) finds a continuum from one extreme to the other in his sample of 34 languages
 - Schiering (2006, 2007) finds local correlations among stress-, syllable-, and mora-related parameters
- Do languages differ with respect to which prosodic domain constitutes the main category?
 - Are ‘stress-timed’ languages characterized by a dominance of the phonological word?

Method: Database

The Leipzig Word Project

(Bickel, Hildebrandt, Schiering et al.)

- Cross-linguistic data on sound patterns
 - delimited by some morphological structure
 - include up to one stem
 - general across the lexicon
- 74 languages
 - world-wide coverage
 - stratified for three language families and three linguistic areas

Method: Coding

- Based on classifications in the literature

Language name	Rhythm class
Arabic (Egyptian)	stress-timed
Fijian (Boumaa)	syllable-timed
Finnish	mora-timed
Mongolian (Khalkha)	mixed
Armenian	unclassified
...	...

- After removing mixed, unclassified (and languages without modal) N = 33

Method: Measuring 'word dominance'

- Limbu (Kiranti, Nepal), cf. van Driem (1987)

(1) Primary Stress Assignment

a. /mɛ-'thaŋ-e=aŋ/ 'they come up and ...'

3ns-come.up-PST=and

b. /'ku-la:p/ 'its wing'

3POSS-wing

Method: Measuring 'word dominance'

- For each process code
 - whether or not it applies within a specific morpheme type (stem, suffix, enclitic, etc.)
 - whether or not it applies to a specific boundary between such morpheme types (e.g. stem-suffix)
- Coded as bit-strings
 - applies to stem: Yes '1', No '0', or NA 'not applicable'
 - applies to prefix: Yes '1', No '0', or NA 'not applicable'
 - etc.
 - applies to stem-suffix: Yes '1', No '0', or NA 'not applicable'
 - applies to prefix-stem: Yes '1', No '0', or NA 'not applicable'
 - etc.

Method: Measuring 'word dominance'

- Limbu Primary Stress Word

– stem-suffix	1
– prefix-stem	1
– prefix-prefix	1
– suffix-suffix	1
– proclitic-stem	NA
– stem-enclitic	1
– proclitic-prefix	NA
– suffix-enclitic	1
– stem	1
– prefix	0
– suffix	0
– stem-endoclititic	NA
– suffix-endoclititic	NA
– stem-infix	NA
– enclitic	0
– proclitic-proclitic	NA
– enclitic-enclitic	1

- 1111NA1NA1100NANANA0NA1

Method: Measuring ‘word dominance’

- Limbu (Kiranti, Nepal), cf. van Driem (1987)

(2) Glottal Stop Insertion

- a. /ku-e:k/ [kuʔe:k] (3POSS-back) ‘his/her back’
- b. /a-mphu-e:/ [amphue:] (1POSS-brother-VOC) ‘Brother!’
- c. /nu-ba=i:/ [nu-bai:] (be.alright-NOM=Q) ‘Is this OK?’
- d. /a-i:r-ε/ [ʔaʔi:rE] (1-wander-PST) ‘We wandered.’

Method: Measuring 'word dominance'

- Limbu Glottal Stop Insertion Word

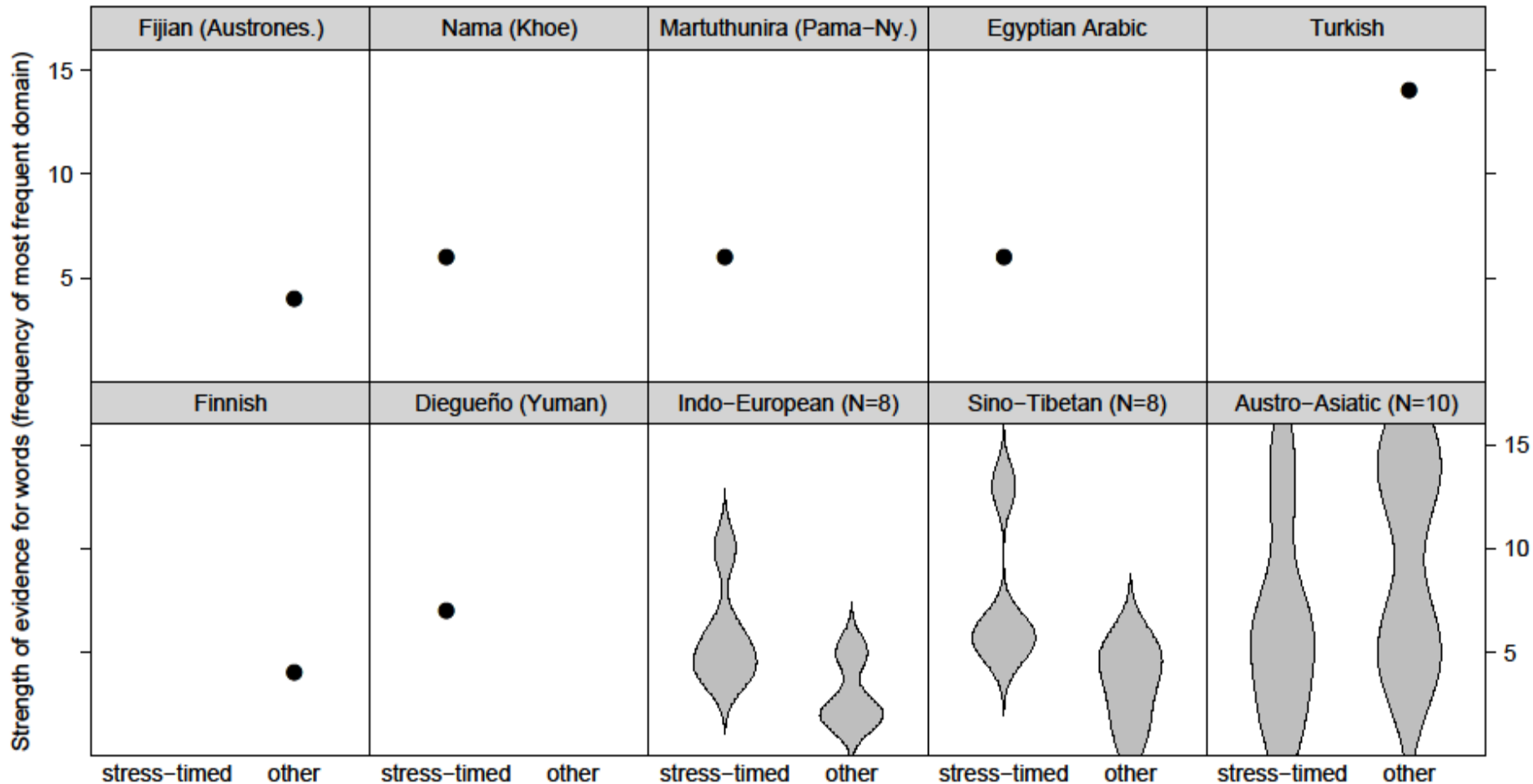
– stem-suffix	1
– prefix-stem	0
– prefix-prefix	0
– suffix-suffix	1
– proclitic-stem	NA
– stem-enclitic	1
– proclitic-prefix	NA
– suffix-enclitic	1
– stem	1
– prefix	0
– suffix	0
– stem-endoclititic	NA
– suffix-endoclititic	NA
– stem-infix	NA
– enclitic	0
– proclitic-proclitic	NA
– enclitic-enclitic	0

- 1001NA1NA1100NANANA0NA0

Method: Measuring 'word dominance'

- Since most languages have more than one word
 - determine the modal (i.e. most frequently referenced) domain
 - take the frequency of that domain as a measure for word dominance
- Limbu word domains and frequency of reference:
 - 1111NA1NA1100NANANA0NA1 3
 - 1000NA0NA0000NANANA0NA0 2
 - 1001NA1NA1100NANANA0NA0 2
 - 0000NA0NA0000NANANANANA0 1
 - 0000NA0NA0100NANANA0NA0 1
 - 0010NA0NA0010NANANA0NA0 1
 - 0100NA0NA0000NANANA0NA0 1
 - 1110NA0NA0000NANANA0NA0 1

Results: Languages and families



Statistics and plots courtesy of Balthasar Bickel

Results: Languages and families

- Stress-timed languages tend to have more phonological processes referencing their most frequent word domains
- However, there is no statistical support for this in our data (assuming a 5% rejection level on a permutation-based t-test)
- Notable exceptions include
 - individual languages (e.g. Turkish)
 - but also families (e.g. Austroasiatic)

Discussion

- The results remain inconclusive with respect to the feasibility of the proposed typology (perhaps biased by Indo-European?)
- However, this suggests that ‘word dominance’ is better predicted by diachronic signatures than by universal correlations
(cf. Hildebrandt & Bickel 2005, Blevins 2007, Bickel et al. 2009)
- Consider the domain structure of Mon-Khmer words (as the stress-timed part of Austroasiatic)

Discussion: Mon-Khmer words

- (cə**CCVC**)_ω in Mon (Jenny 2005, Bauer 1982)

(3) The minimal/maximal word

a. /ʔa/ → ([ʔa:])_ω 'go'

b. /təʔ+nəʔ/ → ([tənəʔ])_ω 'these'

c. (hə-làc)_ω [CAUS-break.down] 'blast away'

d. (k-ə-ləʔ)_ω [cross-CAUS-over] 'take across'

(4) Stress in Mon (Bauer 1982: 99ff.)

a. (¹tɛm)_ω 'to know'

b. (pə-¹tɛm)_ω [CAUS-know] 'to inform'

c. (k-ə-¹ləʔ)_ω [cross-CAUS-over] 'take across'

Discussion: Mon-Khmer words

- Prosodic words in Mon typically reference
 - the monosyllabic, monomorphemic stem
 - the disyllabic, maximally inflected word
- Essentially, this bimodal distribution is retrievable throughout the family
- The evidence from Mon-Khmer reveals inherited sesqui-syllabic word structure rather than some universal effect of ‘stress-timing’

Conclusions: Prospects for prosodic typology

- Stress-timed = word-based?
 - Presumably not!
- Major prosodic category
 - Stress, quantity, or what else?
 - The stronger stress is realized phonetically, the higher its impact on the phonological system (Schiering 2007)
- Prosodic domain structure
 - Diachronic signatures
 - Stress-related domains tend to be universally larger than other domains (Bickel et al. 2009)

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