Comparing cues

A mixed methods study of intonation unit boundaries in three typologically diverse languages

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We gratefully acknowledge the Kera'a, Waima'a and Warlpiri people who provided the material used in this presentation. We acknowledge that the Warlpiri data was recorded on Warlpiri and Gurindji land and we pay our respects to their elders past, present and emerging.

Background

In this presentation, we investigate:

- which boundary cues are most frequent
- which boundary cues are most salient
- what motivates cue choice

in three understudied languages.

Background

Motivation for the study

- Claims for universality of intonation unit boundary cues, like pauses, pitch resets, final lengthening and initial rushes (Himmelmann et al. 2018)
- Variation of the relative importance of intonational boundary cues on a language-specific basis (Izre'el and Mettouchi 2015: 23)
- Different realisations of most common cues across languages (Himmelmann et al. 2018: 239)
- Less systematic boundary cues such as creaky voice reinforcing the perception of prosodic boundaries (Wagner and Watson 2010)

Background

The languages we investigate have different typological profiles:

			Lexical Tone	Lexical Stress
Waima'a	Austronesian	Timor-Leste	✗	✗
Warlpiri	Pama–Nyungan	Northern Australia	✗	✓
Kera'a	Tibeto-Burman	NE India	✓	?

Hypothesis

We hypothesise:

1. some cues are more salient than others
2. speakers of each selected language will differ in what cues they use most frequently
3. that the choice of cues will be affected by the discourse organisation of an utterance
4. that cue choice will be affected by the typological profile of each language

Methods

Using naturalistic field data, we segmented texts into intonation units, followed by a manual annotation in Praat for presence of boundary cues.

Language	Minutes	Speakers	Genres	Text no.	IU no.	Sources	Coder
Warlpiri	19	4 (4F)	Fluid mix of procedural texts / narratives, elicited and non-elicited	9	485	Texts elicited and transcribed by Carmel O'Shannessy (ANU) & Morton 2009a, Morton 2009b, Morton 2009c, Morton 2009d, Morton 2009e, Daniels 2009, Presley 2009	Maria, Sarah Stolle
Kera'a	15	2 (2M)	Narrative	3	609	Own fieldwork (2020, Naomi)	Naomi, Sarah Stolle
Waima'a	15	5 (2M, 3F)	Procedural texts, narratives - non-elicited	5	438	DOBES documentation project corpus (2002-2006) . Own fieldwork (2019, Kirsten)	Kirsten, Sarah Stolle

Cues

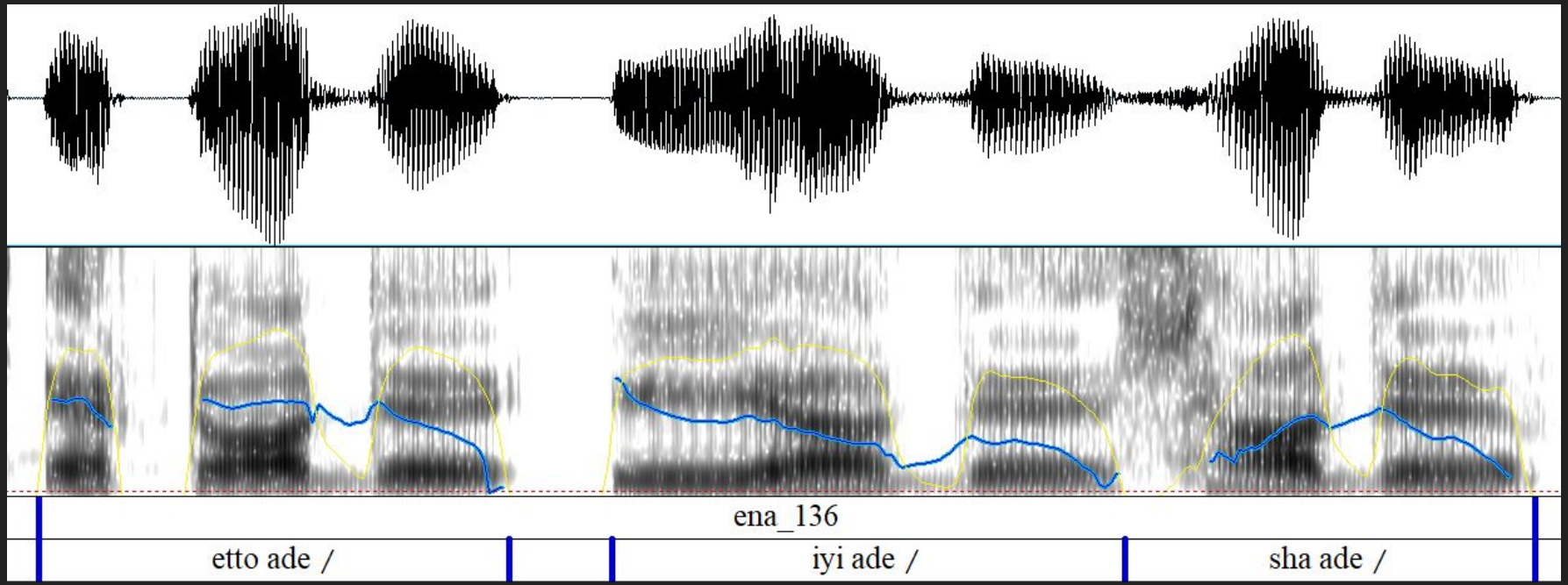
We coded for cues of IU boundaries cited in the literature:

- Pitch resets (Himmelmann et al. 2018)
- Pauses (Himmelmann et al. 2018)
- Final lengthening (of vowels) (Cruttenden 1997, Fletcher 2010)
- Initial rush (anacrusis) (Cruttenden 1997, Fletcher 2010)
- Creaky voice phenomena (cf. Davidson 2020)

We also annotated for other cues we found in these languages which aren’t as commonly cited:

- Tonal parallelism (Croft 2007)
- Final rushes (Fletcher 2010)
- Final devoicing (Kilbourn-Ceron and Sonderegger 2018)
- Initial lengthening (of consonants) (Keating et al. 2003)

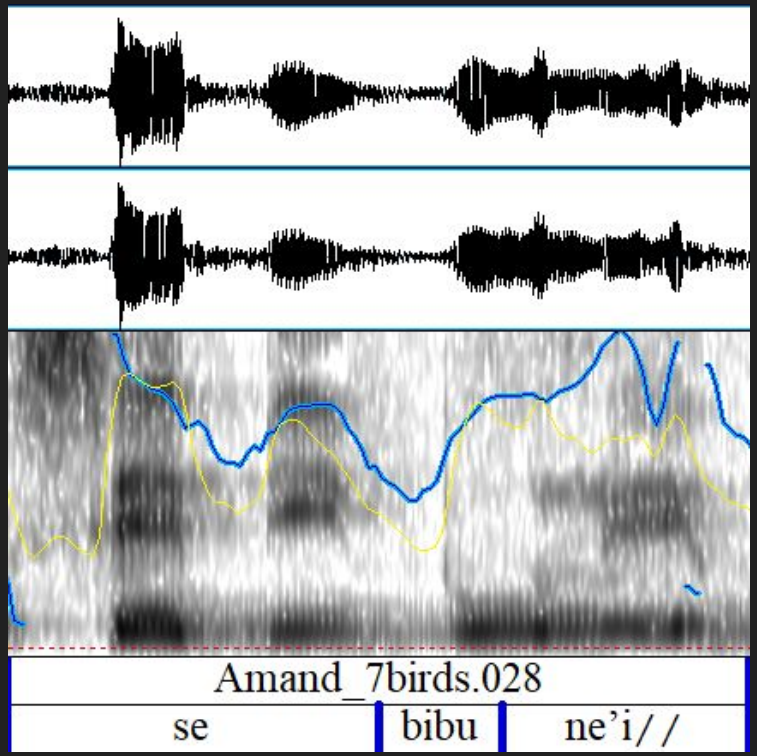
Rarer cues: Tonal parallelism



‘We keep chickens, pigs, mithuns…’

Kera’a; coded by kc, np

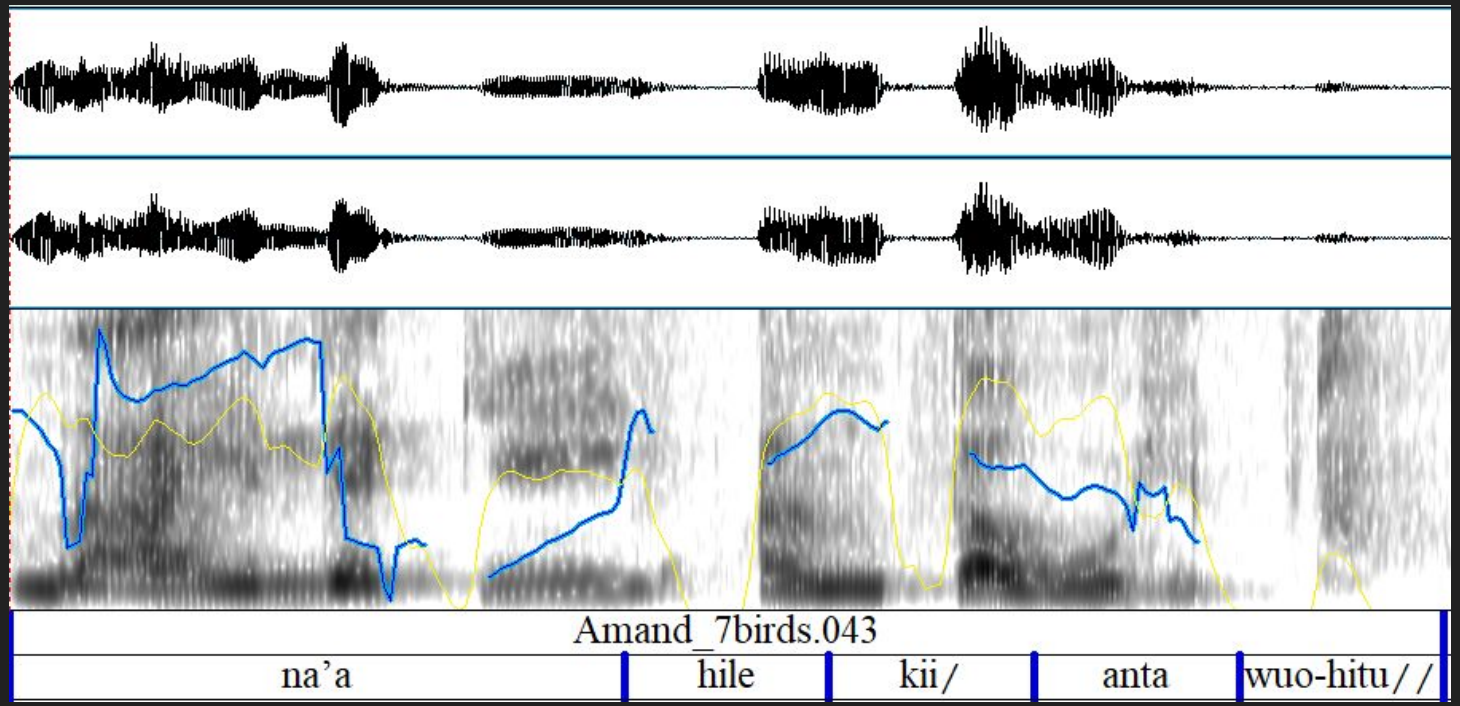
Rarer cues: Final rushes



'The goatherd… '

Waima'a; coded by ss

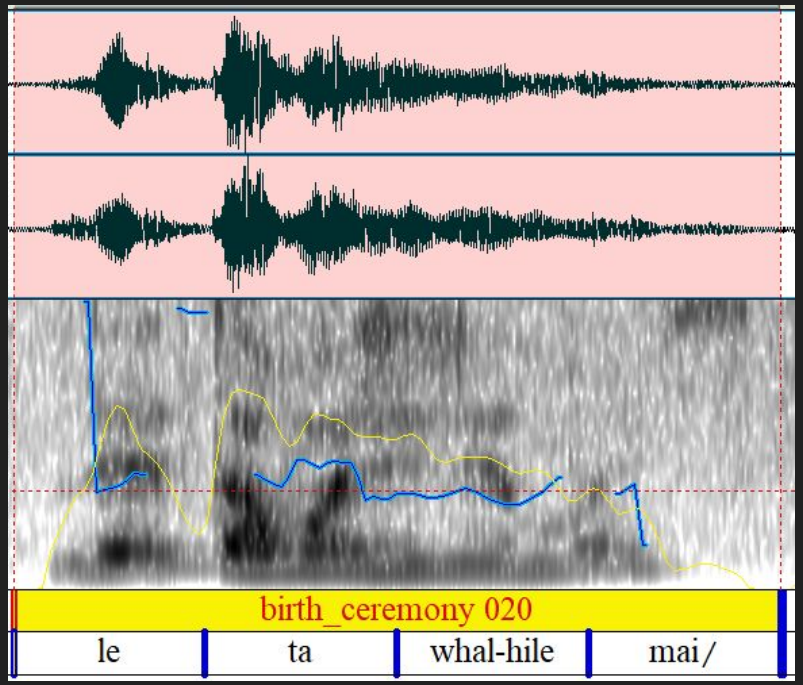
Rarer cues: Final devoicing



'...they became 7 women'

Waima'a; coded by ss

Rarer cues: Initial lengthening of consonants



‘When returning from there...’

Waima’a; coded by kc, mv, np

Results

We hypothesise:

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2. speakers of each selected language will differ in what cues they use most frequently
3. that the choice of cues will be affected by the discourse organisation of an utterance,
4. that cue choice will be affected by the typological profile of each language

Intercoder Reliability

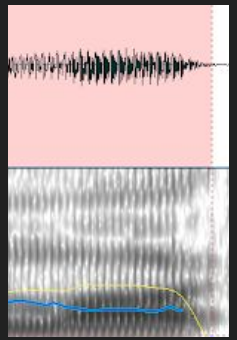
Measure	Gwet's AC1	Brennan-Prediger
Pitch Reset	Very Good	Good
Pause	Very Good	Very Good
Initial Lengthening	Very Good	Very Good
Final Lengthening	Moderate	Moderate
Initial Rush	Good	Good
Final Rush	Very Good	Very Good
Tonal Parallelism	Very Good	Good
Creaky Voice	Good	Moderate
Final Devoicing	Very Good	Good

Differences in Cue Realisation

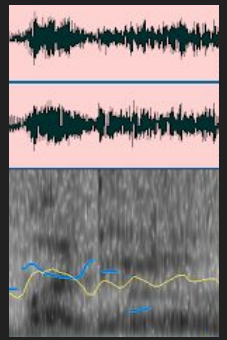
We found that some cues were encoded differently by speakers of different languages.

For example, creaky voice:

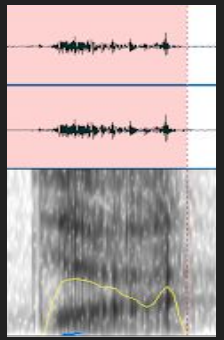
Kera’a



Waima’a



Warlpiri



Relative importance of cues

Pitch resets and pauses were the most frequent boundary cues in our study. The relatively high reliability of coding also supports the fact that these features are cross-linguistically the most salient cues.

However, the relative importance of cues differs from language to language.

	Warlpiri	Waima'a	Kera'a
1	Pauses	Pitch Reset	Pitch Reset
2	Pitch Reset	Pauses	Pauses
3	Creaky Voice	Final Lengthening	Final Lengthening
4	Final Devoicing	Final Rush	Creaky Voice

Cue	Warlpiri	Cue	Waima’a	Cue	Kera’a
Pauses	93%	Pitch Reset	94%	Pitch Reset	91%
Pitch Reset	87%	Pauses	84%	Pauses	82%
Creaky	25%	Fin. Length.	20%	Fin. Length.	45%
Devoicing	25%	Fin. Rush	9%	Creaky	44%
Fin. Length.	18%	Parallelism	9%	Init. Rush	20%
Fin. Rush	13%	Devoicing	7%	Parallelism	11%
Parallelism	13%	Init. Rush	5%	Fin. Rush	5%
Init. Rush	9%	Creaky	5%	Devoicing	2%
Init. Length.	2%	Init. Length.	4%	Init. Length.	0%

Results

We hypothesise:

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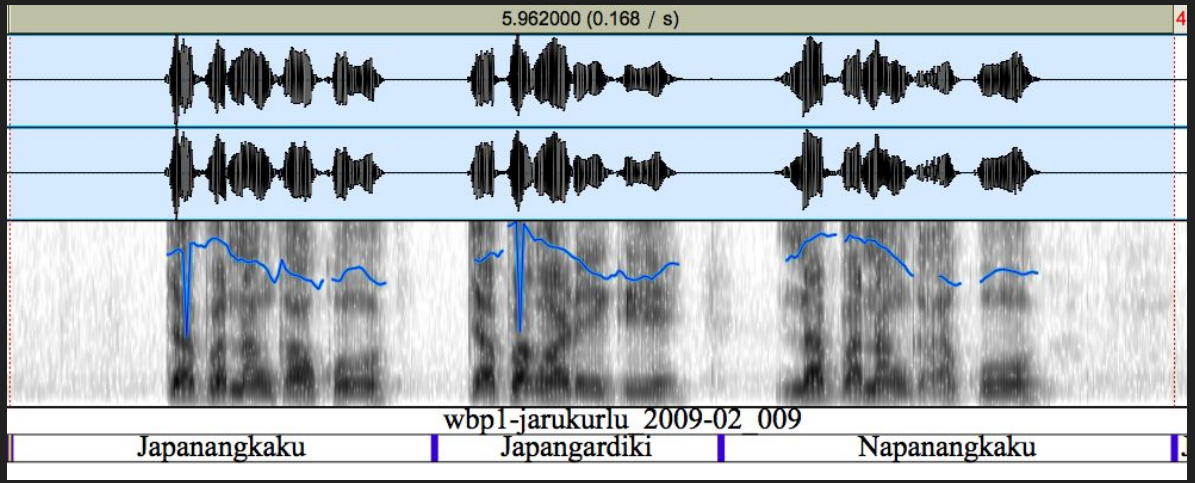
Discourse Organisation

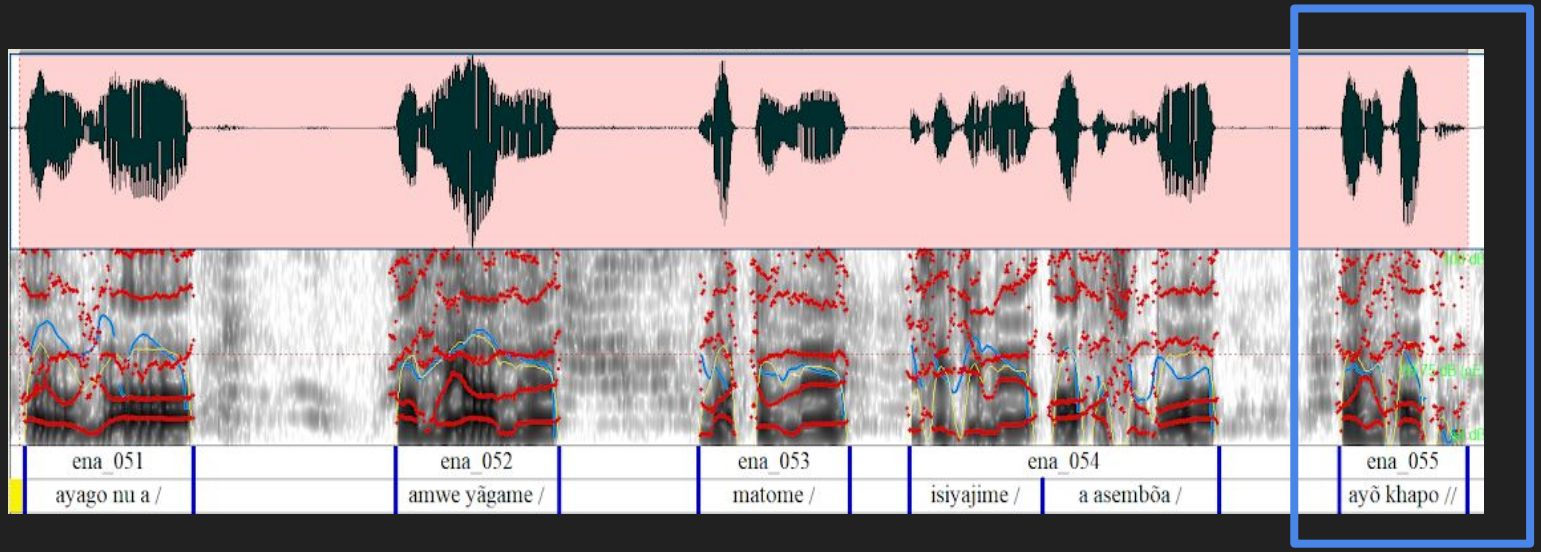
- Initial and mostly impressionistic tendencies
- Discourse organisation effects on:
  - Tonal parallelism
  - Final lengthening and devoicing
- Tendencies either universal or language-specific

Lists and Tonal Parallelism



‘Actually, (the fire wattle; topic of the story) are wurruru for **Japanangka, Japangardi and Napanangka**.’ (Morton 2009b) *(wurruru = egocentric relational term for other half of patrimoiety)*

Paratones, Final Lengthening and Devoicing



Only time final devoicing occurs

No final lengthening

‘And so, they… the wind and the clouds, everything has a place in that tree.’

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Interpreting Cue Choice

The preferences for certain boundary cues can be linked to the typological profile of each language.

- Lexical tone in Kera’a
  - Less final devoicing
  - More creaky voice
- CV(C)V phonological word template in Waima’a
  - Final devoicing only occurs in CV final words
- ‘Intonation only’ system in Waima’a
  - Pitch reset as the main melodic cue
- V-final phonological words in Warlpiri
  - Both final devoicing and final lengthening as frequent cues (but could be epiphenomenal result of language change)

Revisiting the Rarer Cues

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Creaky Voice

Literature has previously downplayed the role of creaky voice as a melodic boundary cue for IUs (e.g. Wagner and Watson 2010:910, Himmelmann et al. 2018:214).

However, our results suggest it is just as frequent (if not more frequent) of a strategy to mark IU boundaries as initial rushes in our data, a boundary cue which has traditionally received more attention.

Cue	Warlpiri	Cue	Waima’a	Cue	Kera’a
Pauses	93%	Pitch Reset	94%	Pitch Reset	91%
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Creaky Voice

The relatively high frequency of creaky voice could be linked to a few different factors:

- Creaky voice associated with lexical tone realisation in Kera’a
- Older speakers speaking with creak in Warlpiri data
- Boundary strength (e.g. Henton and Bladon 1988, Kuang 2018)

But this can’t ‘explain it all away’, and certainly not the variation between languages either.

Expanding the typology

Are there other relevant rhythmic boundary cues apart from initial rushes and final lengthening?

Expanding the typology

- Final rushes used 5~10% of the time
  - More common than initial rushes in Warlpiri and Waima’a

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  - cf. White et al. 2020:12 for possible explanations

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  - cf. White et al. 2020:12 for possible explanations

- Final rushes and initial lengthening more reliably coded than initial rushes and final lengthening

Expanding the typology

We can capture the distribution of these rhythmic cues like so:

	Initial	Final
Rush	Initial rush (anacrusis)	Final rush
Lengthening	Initial lengthening	Final lengthening

Limitations and Future Research

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Limitation 1: Dataset

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- Rough control for genre

Limitation 2: Coding

- Perceptual coding by non-native speakers
  - But with help of Praat
  - But with help of the intercoder reliability test
  - But fairly consistent coding by non-native speakers according to Himmelmann et al. (2018)

Limitation 2: Coding

- Perceptual coding with non-native speakers
- Circular coding: Segmentation ⟷ Boundary Cues

  Preconceived notions of which boundary cues are important may have influenced our segmentation of IUs, which would then influence which cues we code.

  - Only salient cues
  - Adjusted boundary cues for second round of coding

Limitation 3: Underdescribed languages

We are dealing with incomplete phonological descriptions and language change.

What we perceive as boundary cues may be an epiphenomenon of something else.

→ Consequence of looking at understudied and changing languages

→ That’s why it’s worth it!

Future Research

- Phonological profiles and language change

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- Expanded dataset (more IUs, speakers, genres, languages)

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Future Research

- Phonological profiles and language change
- Expanded dataset (more IUs, speakers, genres, languages)
- Better control for speaker / genre effect
- More fine-grained quantitative and qualitative analyses
  a. Reference tracking / coding of paratones / coding of topic and focus
  b. Co-occurrence of cues

Summary

- Even when languages use the same cues, they use them differently
  - Cue preference
  - Cue realisation

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  - Cue preference
  - Cue realisation
- Discourse organisation and typological profiles affect cue choice
- Lesser-studied cues are important
  - Creaky voice
  - Final rushes

Summary

- Even when languages use the same cues, they use them differently
  - Cue preference
  - Cue realisation
- Discourse organisation and typological profiles affect cue choice
- Lesser-studied cues are important
  - Creaky voice
  - Final rushes
- The benefits outweigh the costs of working with lesser-studied languages

Thank you for listening!

We would like to thank

Kera’a, Waima’a and Warlpiri speaking communities

Jane Simpson (ANU), David Nash (ANU), and Carmel O’Shannessy (ANU)

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Project number 406074683

Support from ARC Centre of Excellence for the Dynamics of Language for Warlpiri
Project ID: CE140100041

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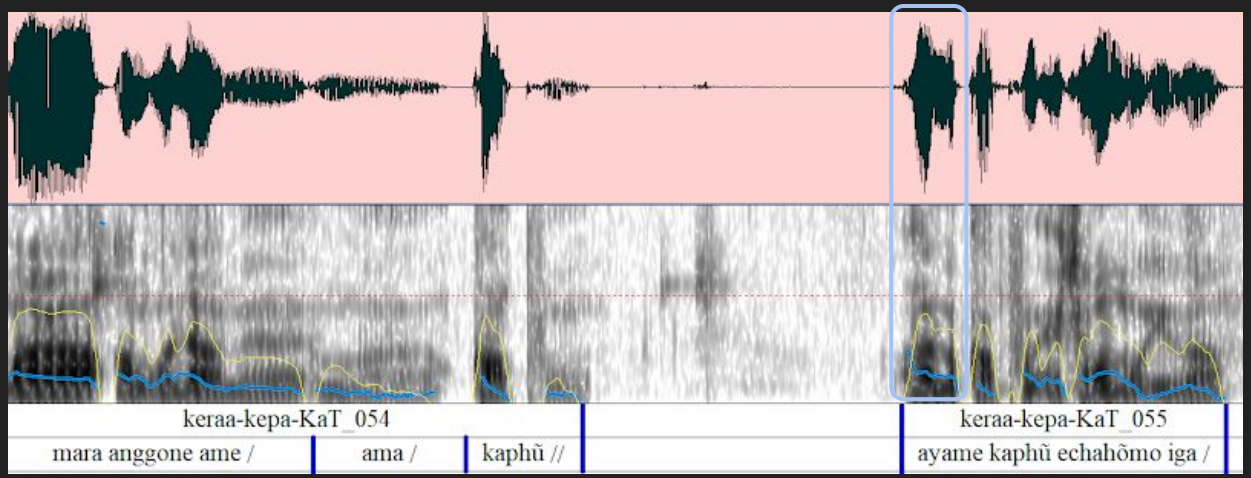
Methods

- Segmentation into intonation units, followed by manual annotation in Praat
- 4 coders
  - 2 native speakers of Australian English (Kirsten + Naomi)
  - 2 native speakers of German (Maria + Sarah)

Waima'a	9 minutes coded by Kirsten	+	5 minutes coded by Sarah	+	1 minute coded by everyone
Warlpiri	13 minutes coded by Maria	+	5 minutes coded by Sarah	+	1 minute coded by everyone
Kera'a	9 minutes coded by Naomi	+	5 minutes coded by Sarah	+	1 minute coded by everyone

Discourse organisation and Rushes

- In Kera’a, rushes tend to occur with
  a. Discourse regulation (hesitation, repairs, um/so/yeah)
  b. Function words
  c. Given or accessible ideas (after Chafe)



‘(The dead child’s) soul which he got back, um, was a bat. **That (soul)** is the bat which still exists today.’

Cue	Warlpiri		Cue	Waima’a		Cue	Kera’a	
Pauses	439/473	93%	Pitch Reset	405/433	94%	Pitch Reset	550/606	91%
Pitch Reset	411/471	87%	Pauses	368/438	84%	Pauses	499/609	82%
Creaky	123/485	25%	Fin. Length.	86/438	20%	Fin. Length.	272/609	45%
Devoicing	122/485	25%	Fin. Rush	39/438	9%	Creaky	266/609	44%
Fin. Length.	85/485	18%	Parallelism	39/438	9%	Init. Rush	119/609	20%
Fin. Rush	61/485	13%	Devoicing	30/438	7%	Parallelism	67/609	11%
Parallelism	64/485	13%	Init. Rush	24/438	5%	Fin. Rush	32/609	5%
Init. Rush	45/485	9%	Creaky	21/438	5%	Devoicing	9/609	2%
Init. Length.	9/485	2%	Init. Length.	18/438	4%	Init. Length.	0/609	0%

Intercoder Reliability

Measure	AC1	Brennan-Prediger
Pitch Reset	0.821	0.704
Pause	0.904	0.872
Initial Lengthening	0.944	0.896
Final Lengthening	0.517	0.481
Initial Rush	0.767	0.649
Final Rush	0.890	0.809
Tonal Parallelism	0.818	0.716
Creaky Voice	0.641	0.484
Final Devoicing	0.859	0.771

Range	Interpretation
0.8 - 1.0	Very Good
0.6 - 0.8	Good
0.4 - 0.6	Moderate
0.2 - 0.4	Fair
-1.0 - 0.2.	Poor

(Altman 1991)