

# Syntactic Pausing? Re-examining the associations

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# Outline

**1** Introduction

**2** Dataset and annotation

**3** Results

**4** Conclusion

# Introduction

# A Pause for Thought

The right word may be effective, but no word was ever as effective as a rightly timed pause.

– Mark Twain

# Background

What is a pause?

- a temporary break in the flow of speech or sign
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Where do pauses occur?

- at higher syntactic boundaries? (Goldman-Eisler 1968; Cooper and Paccia-Cooper 1980)
- at higher prosodic boundaries? (Gee and Grosjean 1983; Ferreira 1993)
- between relevant semantic units? (O'Connell, Kowal, and Hörmann 1969; Ferreira 1993)

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Are there different types of pauses?

- trimodal distribution of pause length in spontaneous data from French vs. bimodal distribution of pause length in read data from European languages (Campione and Véronis 2002; Demol, Verhelst, and Verhoeve 2007)
- some pauses are affected by aphasia, while others are not (Quinting 1971; Kirsner et al. 2002)
- pauses at clause boundaries reflect sentence planning; pauses within clauses reflect lexical retrieval (Levelt 1989; Kircher et al. 2004)

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# Issues

- 1 Pausing has rarely been investigated outside of major world languages.
- 2 Most studies of pausing have been conducted in laboratory conditions using:
  - reading tasks and/or
  - controlled stimuli
- 3 Little work has been done into the correlation between pause location and pause duration.

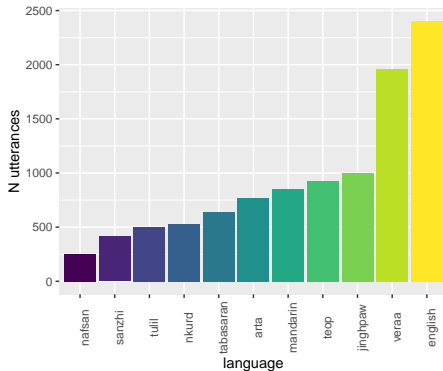
# Research Questions

- 1 If there is a pause, is there a clause boundary?
- 2 How strongly are different clausal contexts associated with pauses?
- 3 Does the clausal context affect the duration of a pause?

# Dataset and annotation

# The MultiCAST corpora (Haig and Schnell 2021)

- corpus collection of 15 typologically distinct languages
- monologic, naturalistic narratives
- we analyse the data of 11 languages



# The MultiCAST corpora (Haig and Schnell 2021)

All texts in our selection are accompanied by a .wav file and an .eaf file (*ELAN (Version 6.2) [Computer software]* 2021), annotated with GRAID (Haig and Schnell 2014). Each text includes annotations for:

- main clause boundaries (##)
- dependent clause boundaries (#; %)
- other syntactic units (e.g., np; v)

# Extracting prosodic breaks

Sound: To TextGrid (silences) ×

Parameters for the intensity analysis

Minimum pitch (Hz):

Time step (s):

Silent intervals detection

Silence threshold (dB):

Minimum silent interval duration (s):

Minimum sounding interval duration (s):

Silent interval label:

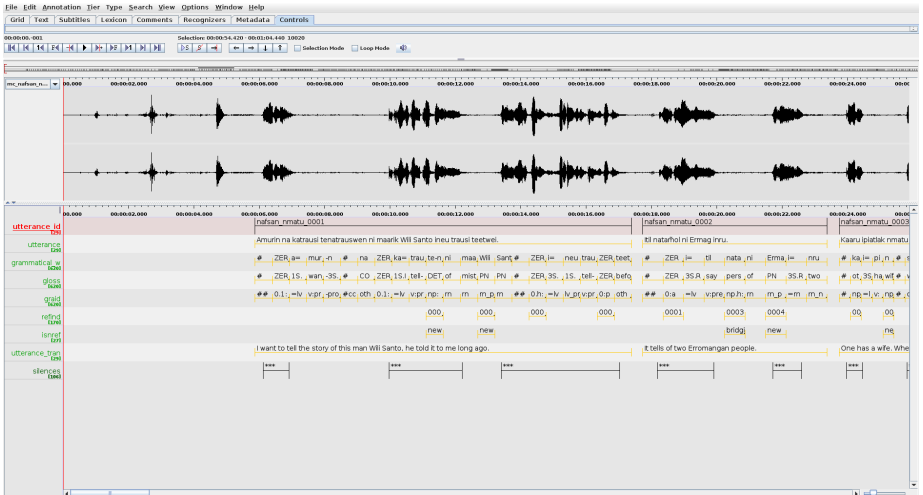
Sounding interval label:

Following a process originally described in Kashima (2017), we used Praat (Boersma and Weenink 2021) to automatically extract periods of speech from the data. Our settings impose a minimum threshold of 50msec for silences and 100msec for speech. Using a higher threshold for speech avoids annotating short bursts of noise, such as claps, as speech.

These TextGrids were then imported into the relevant .eaf file from MultiCAST and are in the process of being manually corrected.



# Checking Associations



# Data processing

Begin Time	End Time	Duration	utterance_id	silences	grammatical	graid	gloss
6130	6403	273	nafsan_nmatu_0001	***	#	##	#
6403	6918	515	nafsan_nmatu_0001	***	ZERO	0.1:a	ZERO
6918	6927	9	nafsan_nmatu_0001		ZERO	0.1:a	ZERO
6927	7450	523	nafsan_nmatu_0001		a=	#NAME?	1S.RS=
7450	7974	524	nafsan_nmatu_0001		mur-i	v:pred	want-TS
7974	8498	524	nafsan_nmatu_0001		-n	-pro:p	-3S.O
8498	9021	523	nafsan_nmatu_0001		#	#cc	#
9021	9545	524	nafsan_nmatu_0001		na	other	COMP
9545	9981	436	nafsan_nmatu_0001		ZERO	0.1:a	ZERO
9981	10069	88	nafsan_nmatu_0001	***	ZERO	0.1:a	ZERO
10069	10592	523	nafsan_nmatu_0001	***	ka=	#NAME?	1S.IRS=
10592	11116	524	nafsan_nmatu_0001	***	traus-i	v:pred	tell-TS
11116	11640	524	nafsan_nmatu_0001	***	te-natrausw	np:p	DET-story
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12163	12215	52	nafsan_nmatu_0001	***	maarik	rn	mister
12215	12687	472	nafsan_nmatu_0001		maarik	rn	mister
12687	13210	523	nafsan_nmatu_0001		Wili	rn_pn_np	PN
13210	13410	200	nafsan_nmatu_0001		Santo	rn	PN
13410	13734	324	nafsan_nmatu_0001	***	Santo	rn	PN
13734	14258	524	nafsan_nmatu_0001	***	#	##	#
14258	14781	523	nafsan_nmatu_0001	***	ZERO	0.h:a	ZERO
14781	15305	524	nafsan_nmatu_0001	***	i=	#NAME?	3S.RS=
15305	15829	524	nafsan_nmatu_0001	***	neu	lv_pro.1:g	1S.BEN
15829	16352	523	nafsan_nmatu_0001	***	traus-i	v:pred	tell-TS
16352	16876	524	nafsan_nmatu_0001	***	ZERO	0:p	ZERO
16876	17030	154	nafsan_nmatu_0001	***	teetwei	other	before
17030	17400	370	nafsan_nmatu_0001		teetwei	other	before
17740	18184	444	nafsan_nmatu_0002		#	##	#
18184	18366	182	nafsan_nmatu_0002	***	#	##	#
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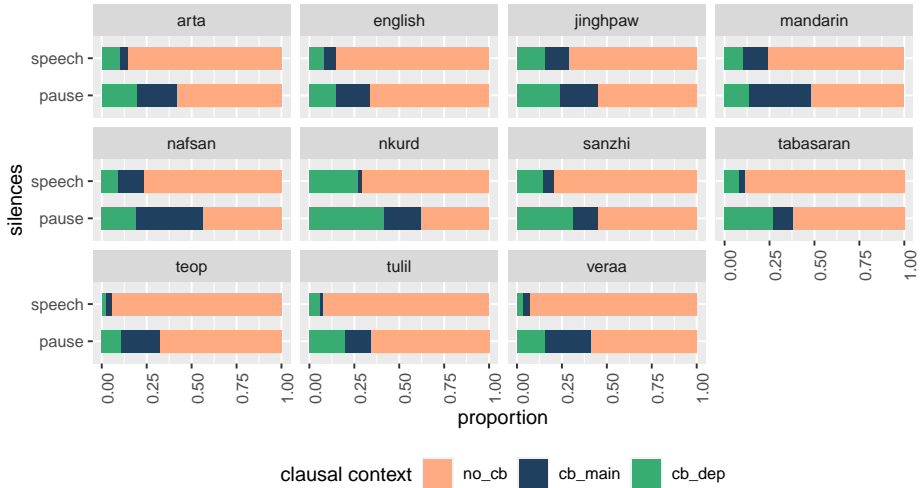
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## Results:

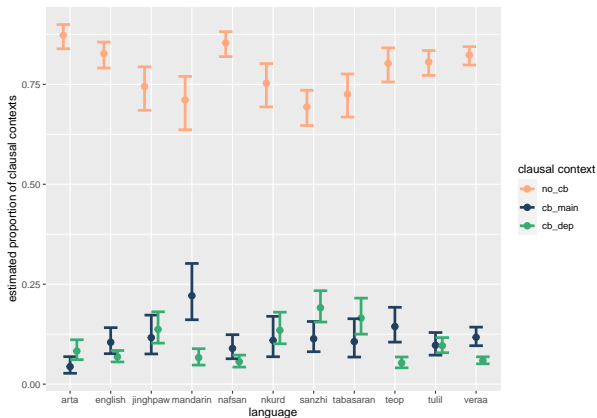
- ① The distribution of pauses across clausal contexts

# Distribution of clausal contexts



# The distribution of pauses across clausal contexts

- we fitted a multinomial regression model to assess the probability of pauses occurring with three clausal contexts (no\_cb, cb\_main, cb\_dep)
- we used Bayesian methods with Stan (Carpenter et al. 2017) and brms (Bürkner 2017) in R (R Core Team 2021)
- $cl\_context \sim 1 + language + (1|speaker)$



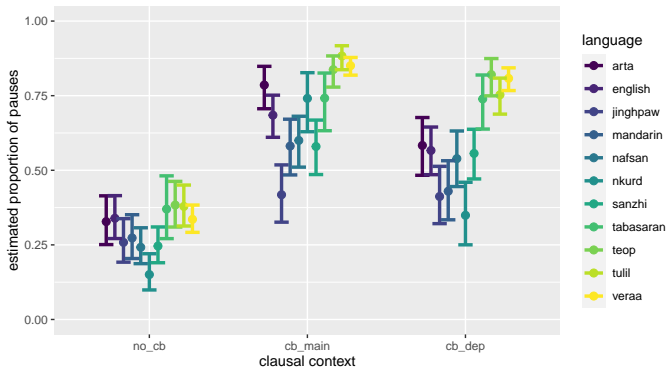
## Results:

- ② The association of clause boundaries with pauses



# The probability of pauses across clausal boundaries

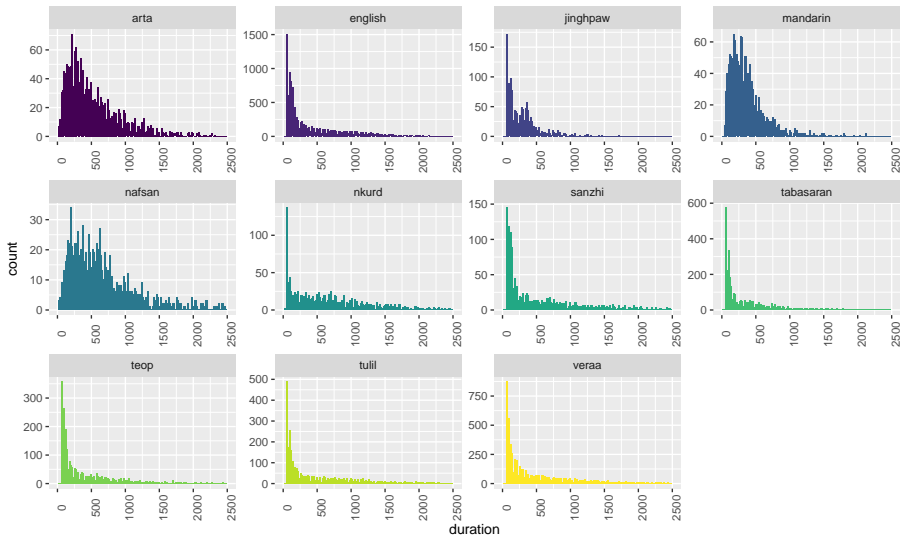
- we fitted a logistic regression model to assess the probability of pauses across clausal contexts (no\_cb, cb\_dep, cb\_main)
- $\text{pause} \sim 1 + \text{cl\_context} * \text{language} + (1|\text{speaker})$



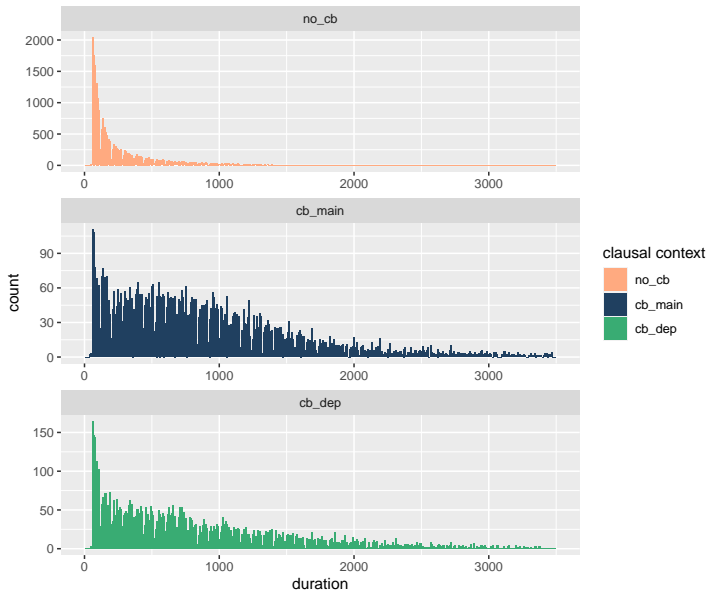
# Results

## ③ Pause durations

# Pause durations by language

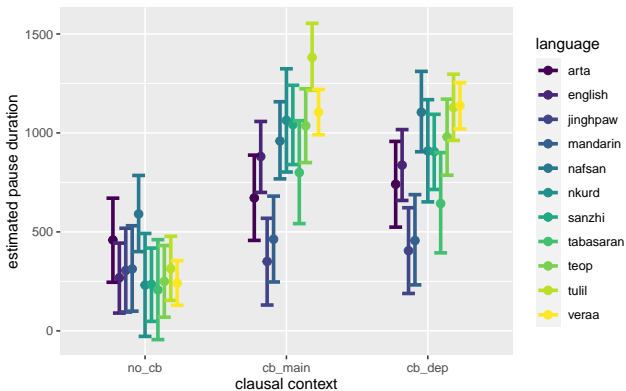


# Pause durations by clausal context



# Pause durations by clausal context

- we fitted a regression model to predict the duration of pauses across clausal contexts and languages
- $\text{duration} \sim \text{cl\_context} * \text{language} + (1 | \text{speaker})$



# Conclusion

# Summary of Results

- Results support work against a direct relation between syntax and prosody
  - Pauses are not strongly associated with clause boundaries
    - More likely to occur within clauses than at clause boundaries
  - Main clause boundaries are (weakly) associated with pauses
    - probability of a pause at a main clause boundary above 0.5 for most languages
    - similar result for dependent clause boundaries in some languages
  - Clause boundary level (weakly) affects pause duration
    - > 500 ms for clause boundaries in most languages
    - < 500 ms within clauses in most languages
- Results not discussed here today:
  - Effects hold across a linguistically-diverse sample, although there are differences in distribution between languages
  - High degree of individual variation in pause duration

# Future Research

- Refining coding method and annotation
  - Checking for any bias caused by pauses in the original clausal analysis
  - Further manual annotation of current data
- Refining the model by including information about other factors affecting pause location, rate, and duration
  - Prosodic units
  - Other syntactic units (e.g. phrases)
  - Semantic units
  - Speaking rate
- Using data from other (types of) languages
  - e.g. DoReCo



**Thank you!**

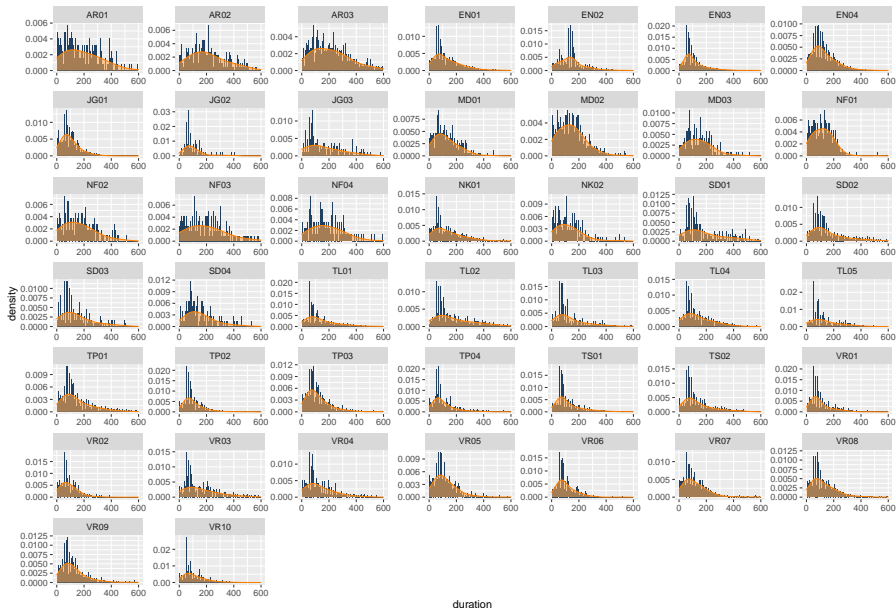
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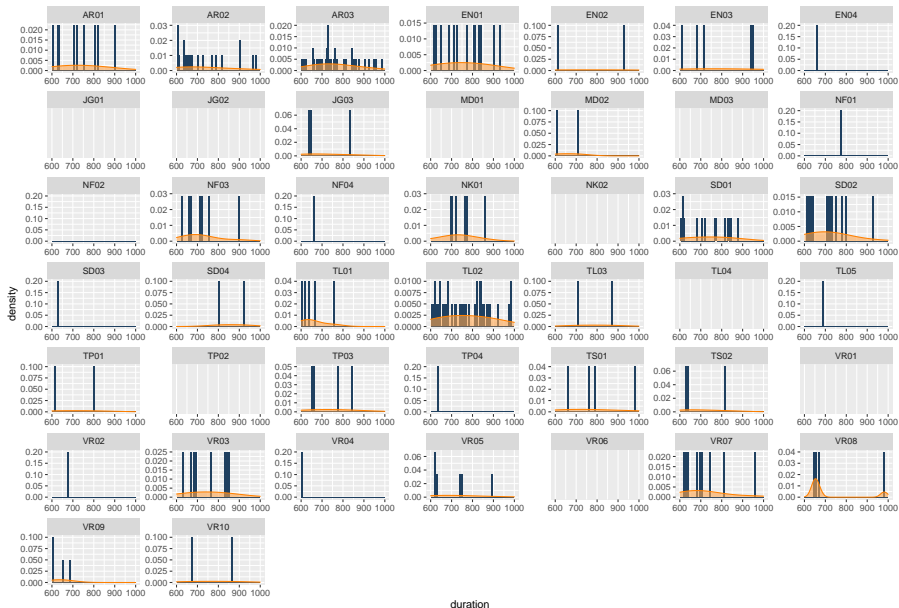
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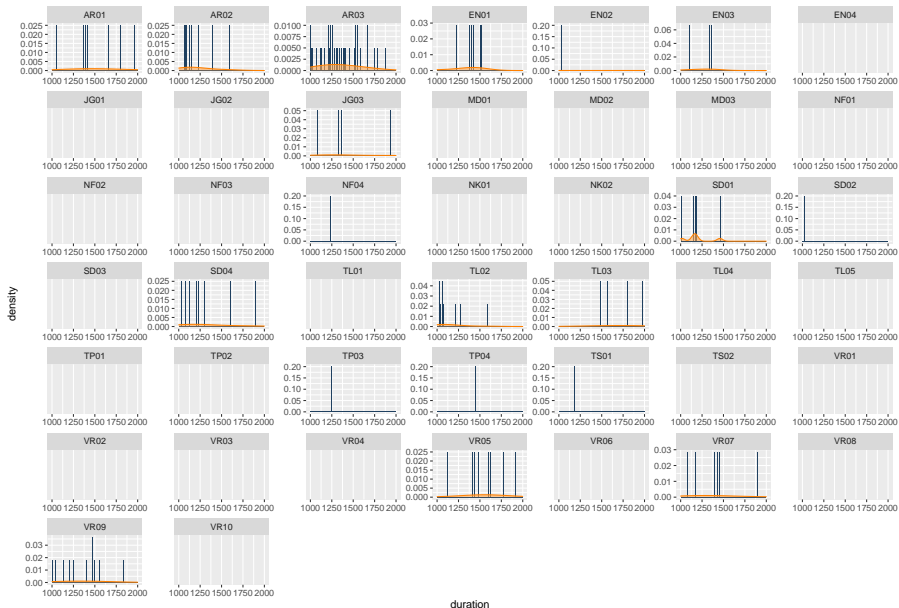
# The distribution of pause lengths 0-600 msec



# The distribution of pause lengths 600-1000 msec



# The distribution of pause lengths 1000-2000 msec



# Could a threshold for pause durations affect our results?

