

# Challenging WEIRD phonetic assumptions: phonetic fieldwork in rural Mexico

Christian DiCanio  
cdicanio@buffalo.edu

Department of Linguistics  
University at Buffalo

1/7/22 and 2/10/22

# Methods sometimes fail

Typical assumptions and constraints in experimental design may either be inapplicable or impossible to implement in field contexts.

The field strongly benefits from phonetic fieldwork, but **our** challenge is maintaining careful design standards for in-situ field sites.

# Outline

1. WEIRD field assumptions and solutions
  - a. Case study (literacy): prosodic boundary elicitation while controlling for tonal context
  - b. Case study (imitation): delayed shadowing tasks and methods to avoid imitation
  
2. Solutions for design difficulties
  - a. Literacy and language learning goals which overlap with experimental or exploratory goals
  - b. Flexibility in preregistration

## WEIRD assumptions

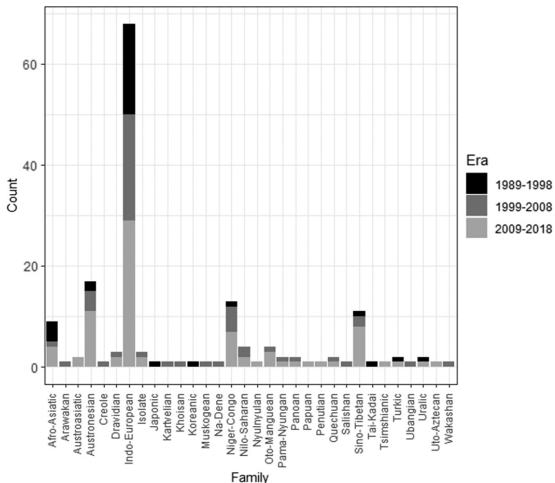
Languages spoken in WEIRD societies (Western, educated, industrialized, rich and democratic) (Henrich et al., 2010) dominate research in phonetics.

Studies on (majority dialects of) Western Indo-European languages continue to dominate phonetic research.

The development of more advanced experimental methods often relies on a set of assumptions true for these languages (but less true for others), especially as related to educational background.

# JIPA Illustrations from 1989 - 2018

(Whalen, DiCano, and Dockum 2020)



# WEIRD problems

- Most work on the phonetics of prosody involves a reading task with careful control of prosodic context, but only  $\sim 10\%$  of the world's languages have literacy (Harrison, 2007).
- Tasks involving goodness ratings or evaluation of non-linguistic stimuli may fail with populations unfamiliar with experiments in an educational setting.
- Close attention to phonetic detail in perception is influenced by literacy (McGuire, 2010). This will predict different outcomes in listening and shadowing tasks with illiterate speakers than with literate speakers.

# Case studies on the phonetics of prosody in Mixtecan languages

- Research on the prosodic structure of Itunyoso Triqui (ISO trq) and Yoloxóchitl Mixtec (ISO xty) in rural Mexico.
- Both languages are Otomanguean: Mixtecan and have approximately 2,500 speakers; mostly illiterate in their native language. These are heavily tonal (9+ tones) languages.
- Higher-level prosodic contrasts (information structural, positional, intonational) were investigated in the field from 2015 - 2019.

Challenge: Controlling for tone, phonation type, word length, and context is necessary when examining prosody.

# Literacy, prosody, and information structure

Several studies examining prosodic focus involve reading tasks

e.g. in Mandarin (Chen and Gussenhoven, 2008; Xu, 1999), Guaraní (Clopper and Tonhauser, 2013), Arabic (de Jong and Zawaydeh, 2002), German (Mücke and Grice, 2014), Dutch (Peters et al., 2014)

An alternative with illiterate speakers of Uspanteko (Bennett et al., 2021), Itunyoso Triqui (DiCano and Hatcher, 2018), Yoloxóchitl Mixtec (DiCano et al., 2018) - short narrative texts followed by question-and-answers.

Speakers successfully answer questions related to the text without many problems.



# Triqui example in tonal orthography

4. Ngo2 chu3ba4 ka3hanj3 na2noh2=chuj3 ni3ya32 cha2=chuj3.  
 Ki3ni3hin3=chuj3 kkan3 ri3ki3 nna31 ngaj23 na4taj4. Yya3 ka3chin3  
 chi3hna32 ri3ki3=chuj3 ni2 chu3ba4 cha43 ba1hni3. Ni2 na3bin3  
 ya3hmanh3=chuj3 ni2 ki3ni3hin3 cha3ta32 si3 ba2 sah1=chuj3 ni2 cha43  
 cha3ta32=chuj3.

Text

*Una ardilla fue a buscar comida. Vio calabazas en la milpa que estaba en la loma.  
 Desde que tuvo mucha hambre, la ardilla comió tres. Por ponerse muy gordo la  
 águila lo vio mejor y se lo comió.*

Translation

- a. **Un3 chu3ku3 ka3hanj3 na2noh2 ni3ya32 cha2 oh2?**  
*Qué fue el animal que fue a buscar comida?*
- b. **Un3 sin3 cha43 chu3ba4 oh2?**  
*Qué comió la ardilla?*
- c. **Un3 cchej32 ngaj23 nna31 rian32 na3rih3=chuj3 kkan3 oh2?**  
*Dónde estaba la milpa donde encontró las calabazas?*
- d. **Un3 taj3 kkan3 cha43 chu3ba4 oh2?**  
*Cuántas calabazas comió la ardilla?*
- e. **Un3 chu3ku3 cha43 chu3ba4 oh2?**  
*Qué animal comió la ardilla?*

Questions

### Blancos:

chu3ba4	'ardilla'
na4taj4	'loma'
ba1hni3	'tres de algo'
kkan3	'calabaza'
cha3ta32	'águila'

Intended  
 targets from  
 text

Still requires some language literacy.

Either a speaker is trained in literacy and reads the text and questions aloud –or– they record a short narrative in the language and translate questions into the target language for other speakers.

**Potential issue 1:** Speakers may produce single word responses rather as “complete sentences.” Researchers need to ask speakers to produce “full sentences” with a highlight NP, but this may be less natural.

**Potential issue 2:** This method works well for eliciting contrastive or narrow focus, but fails with broad focus.

# Elicitation of prosodic focus in the field

- Narrow focus (after story)

Rey: Who arrived?

Speaker (instructed): John arrived.

Speaker (more natural): John

- Contrastive focus (after story)

Rey: Did Marcus arrive?

Speaker (instructed): John arrived.

Speaker (more natural): No, John did.

- \* Sentential/broad focus

Consultant: What happened?

Speaker: You just told me what happened. Why are you asking me?

In field contexts where broad focus was elicited, both Triqui speakers and Mixtec speakers failed to understand the task's motivation.

Either no response was given or speakers chose to provide what they saw as the “moral of the story.” A question requiring dictation of information that was just given probably does not arise outside of contexts involving literacy.

**Potential solution 1:** Use of existing corpora to find words under broad focus. Though, if you have to match words for tone/length, this option usually is impossible.

**Potential solution 2:** A repetition task for broad focus.

# Repetition/shadowing tasks in the field

The easiest solution? A speaker simply repeats the target sentence under broad focus.

**Potential issue:** Speakers of English and Italian may imitate prosodic contrasts in human language (Cole and Shattuck-Hufnagel, 2011; D'Imperio et al., 2014).

Whether speakers of (a) tonal languages or (b) minority illiterate populations imitate prosodic detail in repetition tasks remain open questions in phonetics.

## Potential solution: delayed shadowing

Sensory memory traces containing detailed phonetic information decay within 300 ms and analyzed sensory memory traces to decay over a slightly longer timecourse (Pisoni, 1973; Xu et al., 2006).

A potential solution here is for speakers to produce a fixed phonetic sequence prior to repeating a target sentence.

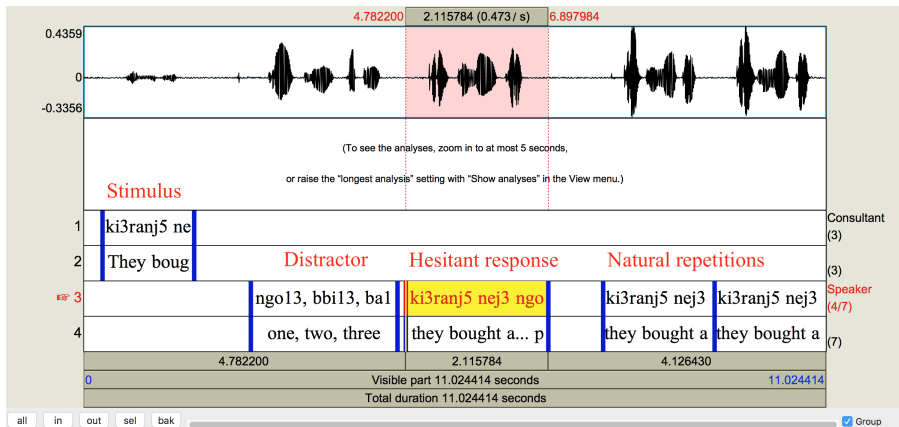
e.g. “One, two, three.... Maria arrived today at 2 PM.”

Goal: the participant reproduces the lexical content (allowing for careful phonetic design) but not the phonetic details from the speaker.

(Acknowledgement: Lisa Davidson)

# Speakers hesitate, but respond well

## Speech sample



## Recruiting a confederate (h/t Katie Franich)

Another alternative that has not been attempted is recruitment of a non-participating confederate in the dialogue between native speakers (Hwang et al., 2015).

Design: a non-participant could come into the room and ask the participant to re-tell the narrative that they heard.

Potential problems:

- To what extent would participants remember all the relevant details (repeat the target words)?
- It is awkward to ask a person to leave and come back for each set of questions (to ensure they do not hear the story).



# What about mining corpora for examples?

In the context of speech prosody, it is often necessary to carefully control for (a) rhythmic and accentual structure (cf. Turk and White, 1999) and (b) word-prosodic features like tone.

While corpus-based phonetic methods have advanced, it is quite difficult to find a substantial set of tonal pairs in different prosodic positions in the same recording.

(Ignoring that you need a transcribed and aligned corpus - possibly substantial.)

# Case study: Mixtec phrase-final lengthening

In a recent study, we examined the interaction between tone and utterance positions (medial/final) in Yoloxóchitl Mixtec. Using a repetition task, we could examine 20 distinct tonal melodies (DiCano et al., 2021).

**Table 1: Experimental stimuli - tonal melodies in disyllabic words.** Note that tones are specified on individual syllables here, not words, for instance, /βa<sup>14</sup>gi<sup>4</sup>/ “rainbow” has an initial rising tone followed by a high tone.

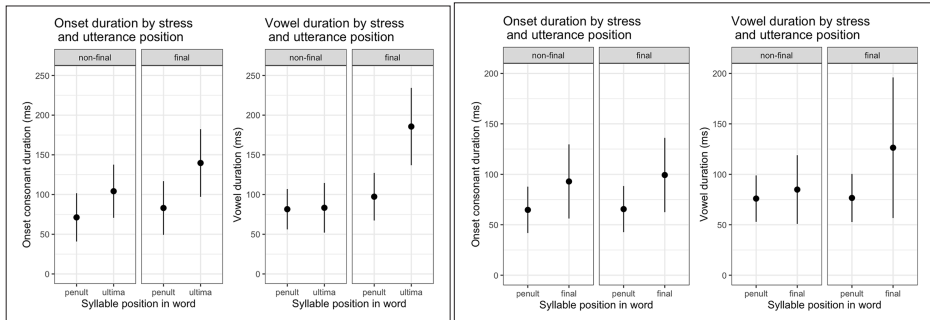
Melody	Word	Gloss	Melody	Word	Gloss
4.4	βa <sup>4</sup> li <sup>4</sup>	“little”	3.4	ɲdi <sup>3</sup> ji <sup>4</sup>	“corncob”
	ju <sup>3</sup> ŋu <sup>4</sup>	“pineapple”		βi <sup>3</sup> ko <sup>4</sup>	“party”
4.3	βi <sup>4</sup> lu <sup>3</sup>	“clay”	3.3	tʃi <sup>3</sup> ju <sup>3</sup>	“work”
	ɲdi <sup>4</sup> ko <sup>3</sup>	“mother”		tʃi <sup>3</sup> jo <sup>3</sup>	“tile”
4.2	tʃi <sup>1</sup> tu <sup>2</sup>	“woodpecker”	3.2	tʃi <sup>3</sup> ta <sup>2</sup>	“banana”
	tʃa <sup>4</sup> na <sup>2</sup>	“grackle”		ta <sup>3</sup> ta <sup>2</sup>	“seed”
4.1	βi <sup>4</sup> ʃi <sup>1</sup>	“difficult”	3.42	βi <sup>3</sup> ta <sup>42</sup>	“soft”
	ta <sup>4</sup> si <sup>1</sup>	“wizard”		tʃa <sup>3</sup> ko <sup>42</sup>	“bearded”
13.3	ki <sup>13</sup> ʃi <sup>3</sup>	“come.PERF”	1.4	βi <sup>1</sup> ko <sup>4</sup>	“cloud”
	ʃi <sup>13</sup> ʃi <sup>3</sup>	“eat.PERF”		ta <sup>1</sup> tā <sup>4</sup>	“medicine”
13.2	βa <sup>13</sup> βi <sup>2</sup>	“knuckle”	1.3	βi <sup>1</sup> ʃi <sup>3</sup>	“cold”
	su <sup>130</sup> du <sup>2</sup>	“doll”		ti <sup>1</sup> ʃi <sup>3</sup>	“belly”
14.3	tʃi <sup>14</sup> kū <sup>3</sup>	“guamuchiles”	1.1	βi <sup>1</sup> ka <sup>1</sup>	“brush”
	tʃi <sup>14</sup> ki <sup>3</sup>	“prickly pear”		ka <sup>1</sup> ta <sup>1</sup>	“press (N)”
14.2	ja <sup>14</sup> kū <sup>2</sup>	“be itchy”	1.32	mi <sup>1</sup> nu <sup>32</sup>	“epazote”
	ɲda <sup>14</sup> ku <sup>2</sup>	“straight”		βi <sup>1</sup> ʃi <sup>32</sup>	“whiskers”
4.13	tʃi <sup>4</sup> tʃi <sup>13</sup>	“ripe”	4.24	ka <sup>4</sup> ni <sup>24</sup>	“long”
1.42	ta <sup>14</sup> wi <sup>42</sup>	“water”	14.4	βa <sup>14</sup> ŋi <sup>4</sup>	“rainbow”

But only three tonal melodies could be examined in a naturalistic corpus (the frog story). Matched utterance-final words were difficult to find.

**Table 3.** Stimuli chosen from corpus.

Melody	Word	Gloss	N (utterance-medial)	N (utterance-final)
3.4	i <sup>3</sup> t ũ <sup>4</sup>	“little”	79	20
3.2	i <sup>3</sup> na <sup>2</sup>	“dog”	12	4
	i <sup>3</sup> su <sup>2</sup>	“deer”	25	13
	sa <sup>37</sup> βa <sup>2</sup>	“frog”	98	37
	ja <sup>3</sup> βi <sup>2</sup>	“hole”	21	5
	jo <sup>3</sup> ko <sup>2</sup>	“wasp”	20	6
	ha <sup>1</sup> na <sup>1</sup> =ra <sup>1</sup>	“pet=3SING.MASC”	133	42

Similar effects of prosodic lengthening were found (results from repetition on left, the corpus results on right).



Note that the scales are slightly different (running speech is faster).

# Summary

Phonetic fieldwork often involves work with illiterate populations.

Careful control of elicitation frames for specific research questions can be accomplished via naturalistic tasks (stories, Q&A) and, where needed, adjustments to simpler repetition tasks.

For more exploratory phonetic research requiring less control, corpus phonetic methods are useful.

## Long-term collaborative work → better design

Not all phonetic studies are directly important to language communities.

Those which are especially useful examine naturalistic contexts encountered by the language community.

Collaborative goals are often clearer to speakers if they are coupled with literacy or pedagogical outcomes.

e.g. production/perception of contrasts that might be otherwise difficult to perceive; recordings that could be used as entries in a dictionary or language learning website.

The Itunyoso Triqui literacy website contains examples of tones in distinct contexts. These contexts serve to illustrate which tones are written and which ones are not.

Triqui de Itunyoso

Sidebar ▾ | Página Principal Home

El tono de triqui: los t...

X. Vocales diferentes con...

IX. Las consonantes h y j...

VIII. Las vocales de triqui

VII. Las consonantes x - yy

VI. Las consonantes: p - tt

V. Las consonantes: m - ...

IV. Las consonantes k - ll

III. Las consonantes: ch - g

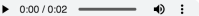
II. Las consonantes: b - ...

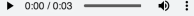
I. Las consonantes de Tri...


Lecciones en el aprendiz...


Acá abajo tenemos palabras ejemplares para distinguir tonos de nivel y incluimos el tono '45' acá también con este grupo. Tomamos en cuenta que no marcamos el tono medio (el tono 3) por ningún acento. Este principio es importante y muy útil - el tono medio es el tono lo más común en el idioma. Entonces, podemos escribir varias oraciones sin marcación tonal en escribir, p.ej. *Kahnah sij yakwej kuki*. 'Él vino a Oaxaca ayer.' Desde que todas las palabras en esta oración tiene tono medio, no necesitamos marcación tonal.

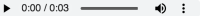
Ejemplos de palabras con tonos diferentes (de nivel) están acá abajo:


*anin* 'estallar' (tono 1 - más bajo)  0:00 / 0:02

*achin* 'faltar' (tono 3 - medio)  0:00 / 0:03

*achínj* 'pedir' (tono 45 - lo más alto)  0:00 / 0:02

*chihí* 'enfermedad' (tono 1 - más bajo)  0:00 / 0:02

*chi* 'abuelo de' (tono 3 - medio)  0:00 / 0:03

*chihí* 'sobre' (tono 4 - alto)  0:00 / 0:02

Your knowledge of the language permits experimental flexibility. Speakers have the most knowledge.

Literacy training is capacity-building for future pedagogy and cross-collaboration.

It is usually more natural for a speaker to read a text in the context of an experiment (and to explain the goals) than it is for a non-speaker to do so.

Training in literacy allows for better collaboration, but also necessitates a long-term investment in studying individual languages.



# Preregistration in linguistic research

“A preregistration is a time-stamped document in which researchers specify prior to data collection how they plan to collect their data and/or how they plan to conduct the data analyses.”

(Roettger, 2021, 1228)

The primary goal of preregistration is to track *analytical flexibility* and counteract publication bias in design.

# Preregistration and design flexibility

Exploratory field phonetics does not require preregistration since it does not involve hypothesis-testing (Roettger, 2021).

Though, careful design is not limited to confirmatory research in field phonetics (prosody!).

Exploratory studies which involve careful design aspects should probably be preregistered. After all, aspects of elicitation design are not the primary reason for preregistration - the focus is more on statistical methods and post-processing.

# Not all exploration is created equal.

**Exploration type 1:** initial stage exploration without much background or knowledge of patterns which interact with each other, e.g. the field linguist has identified phonological contrasts and wishes to record words with these contrasts in different positions of the word.

Probably **not** preregistered.

**Exploration type 2:** involves very intricate knowledge of many aspects of the language's structure (morphosyntax, word-level contrasts), such as prosody/phrasing, intonation, and even certain socio-phonetic features.

Probably preregistered.

Too little flexibility might prevent the types of useful in-the-field adjustments illustrated in the prosodic studies mentioned here.

An ideal scenario – reviewers permit some flexibility in preregistration.

What phonetic fieldwork is preregistered? An evolving question.

## Final remarks

Idealized phonetic research methods may involve biased assumptions.

Read speech itself reflects a speech style that is distinct from spontaneous speech - it is not “neutral” (cf. DiCanio et al., 2021).

Close collaborations with speakers (and literacy training) fosters alternative designs.

Preregistration is not inflexible.

Thank you!

- Bennett, R., Henderson, R., and Harvey, M. (2021). Tonal variability and marginal contrast: Lexical pitch accent in Uspanteko. In Kubozono, H., Itô, J., and Mester, A., editors, *Prosody and prosodic interfaces*. Oxford, UK: Oxford University Press.
- Chen, Y. and Gussenhoven, C. (2008). Emphasis and tonal implementation in Standard Chinese. *Journal of Phonetics*, 36(4):724–746.
- Clopper, C. G. and Tonhauser, J. (2013). The prosody of focus in Paraguayan Guaraní. *International Journal of American Linguistics*, 79(2):219–251.
- Cole, J. and Shattuck-Hufnagel, S. (2011). The phonology and phonetics of perceived prosody: What do listeners imitate? In *Proceedings from Interspeech 2011*, pages 969–972. ISCA.
- de Jong, K. and Zawaydeh, B. (2002). Comparing stress, lexical focus, and segmental focus: patterns of variation in Arabic vowel duration. *Journal of Phonetics*, 30(1):53–75.
- DiCanio, C., Benn, J., and Castillo García, R. (2018). The phonetics of information structure in Yoloxóchitl Mixtec. *Journal of Phonetics*, 68:50–68.
- DiCanio, C., Benn, J., and Castillo García, R. (2021). Disentangling the effects of position and utterance-level declination on the production of complex tones in Yoloxóchitl Mixtec. *Language and Speech*, 64(3):515–557.
- DiCanio, C. and Hatcher, R. (2018). On the non-universality of intonation: evidence from Triqui. *Journal of the Acoustical Society of America*, 144:1941.
- D'Imperio, M., Cavone, R., and Petrone, C. (2014). Phonetic and phonological imitation of intonation in two varieties of Italian. *Frontiers in Psychology*, 5(1226):1–10.
- Harrison, K. D. (2007). *When languages die*. Oxford University Press.
- Henrich, J., Heine, S., and Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and brain sciences*, 33(2-3):61–83.

- Hwang, J., Brennan, S. E., and Huffman, M. K. (2015). Phonetic adaptation in non-native spoken dialogue: Effects of priming and audience design. *Journal of Memory and Language*, 81:72–90.
- McGuire, G. (2010). Orthographic effects on the attention to phonetic cues. Technical report, University of California, Santa Cruz.
- Mücke, D. and Grice, M. (2014). The effect of focus marking on supralaryngeal articulation - Is it mediated by accentuation? *Journal of Phonetics*, 44:47–61.
- Peters, J., Hanssen, J., and Gussenhoven, C. (2014). The phonetic realization of focus in West Frisian, Low Saxon, High German, and three varieties of Dutch. *Journal of Phonetics*, 46:185–209.
- Pisoni, D. B. (1973). Auditory and phonetic memory codes in the discrimination of consonants and vowels. *Perception and Psychophysics*, 13(2):253–260.
- Roettger, T. B. (2021). Preregistration in experimental linguistics: applications, challenges, and limitations. *Linguistics*, 59(5):1227–1249.
- Turk, A. and White, L. (1999). Structural influences on accentual lengthening in english. *Journal of Phonetics*, 27(2):171–206.
- Whalen, D. H., DiCanio, C., and Dockum, R. (2020). Phonetic documentation in three collections: Topics and evolution. *Journal of the International Phonetic Association*, TBA(1–27).
- Xu, Y. (1999). Effects of tone and focus on the formation and alignment of F0 contours. *Journal of Phonetics*, 27(1):55–105.
- Xu, Y., Gandour, J. T., and Francis, A. L. (2006). Effects of language experience and stimulus complexity on the categorical perception of pitch direction. *Journal of the Acoustical Society of America*, 120(2):1063–1074.