Learning from experiment experience: How to run phonetic experiments in the field*

Hannah Sande · Madeleine Oakley

Georgetown University

`hannah.sande@georgetown.edu` · `mo643@georgetown.edu`

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1   Introduction

- **Background:** Phonetics is an important area of linguistic knowledge that is often unexplored in language documentation projects (Heston, 2017).

  - Understanding the acoustics, articulation, and perception of segments and supersegments across languages can inform

    1. *Typology:* The range of variation of productions of a given segment or supersegment.
    2. *Phonetic research:* Acoustic and articulatory strategies for producing a given phonological contrast.
    3. *Phonological theory:* Whether language-specific phonetics affect phonological patterning.
    4. *Reconstruction and revitalization efforts:* How languages no longer spoken were once pronounced.

  - Whalen et al. (2018) develop a set of acoustic measurements and score a set of descriptive phonetic articles for the level of coverage of each category.

    - Articles: 152 from JIPA (Journal of the IPA), 110 from JPhon (Journal of Phonetics), and 25 from SOWL (Sounds of the World's Languages).

      (1) **Phonetic measures to be documented**

Consonants	Vowels	Suprasegmentals
VOT	**Formants**	**Stress**
Closure duration	**Dispersion**	**Length**
Voicing	**Vowel features**	**Tone/pitch**
Formant transitions	Duration	Intonation
Fricative spectrum	Intensity	**Interactions**
Fricative duration	Interactions	Other
Burst characteristics	Other	
Preaspiration		
Sonorants		
Other		

    - Coverage in JIPA and JPhon averaged around 12% of the above categories per article. The average for SOWL articles was closer to 40%.

– Whalen et al. only consider acoustic documentation. There is even less articulatory and perceptual documentation available.

- **Hypothesis:** Based on experience running acoustic and perception experiments in a fieldwork setting, we hypothesize that one limiting factor in phonetic documentation is the difficulty of carrying out phonetic experiments in the field.

- **In this talk:**

  1. We describe our own experiences running a series of acoustic and perceptual experiments as part of a documentation project on Guébie (Kru) in Gnagbodougnoa, Côte d'Ivoire in Summer 2018.

  2. We discuss the challenges we encountered in carrying out these phonetic experiments, and suggest concrete solutions for overcoming such challenges in the future.

     Caveat: We acknowledge that every field site and documentation experience is different. What worked for us may not work for you, but perhaps our suggestions can help you all to brainstorm about possible solutions for overcoming challenges in phonetic documentation.

2   Background on Guébie

- Background on Guébie:

  ▷ Number of speakers: ∼7,000
  ▷ One remaining monolingual speaker
  ▷ Spoken in 7 villages in a jungle in southwest Côte d'Ivoire
  ▷ Most Guébie speakers speak French, many also speak other neighboring Kru languages
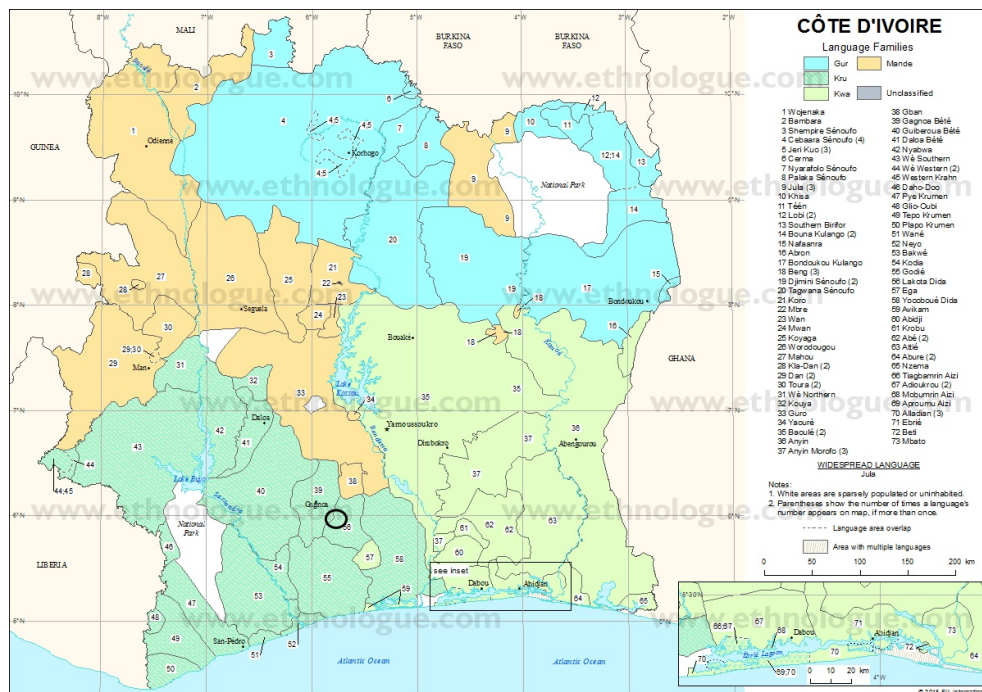
- Sande has been working with the Guébie community to document the language since Fall 2013.

2.1   Implosives in Guébie

- There is one implosive sound in Guébie: /ɓ/.

    - /ɓ/ patterns with sonorants in three respects, and never patterns with obstruents.

        1. CVCV reduction to CCV is highly likely if the second C is /l/ or /ɓ/, but not otherwise. There are no other instances of CC clusters in the language.

            (2)   **CVCV → CCV**

	CVCV	**CCV**	Gloss
a.	jɩla$^{2.3}$	jla^{23}	'ask'
b.	duɓu$^{3.3}$	dɓu^3	'mourn'
c.	bete$^{3.1}$	*bte^{31}	'break'

        2. Vowel hiatus is avoided by inserting /j/, /w/, or /ɓ/.

        3. In certain morphosyntactic environments, when /ɓ/ would otherwise be reduplicated, it instead surfaces as [l].

            * See Kaye et al. (1981) on a similar historical change in Dida and Bete, two neighboring Kru languages.

            (3)   ɓ/l *alternation in reduplication*

                a.   ɓɔ-lɔ-lɪ$^{2.2.2}$
                     finish-RED-NMLZ
                     'the end'

                b.   wa^3 ji^3 ji-ɓe-le-li$^{3.1.2.2}$
                     3PL.NOM FUT   PART-know-RED-RECIP
                     'They will get to know each other '

- Implosives pattern with different classes of sounds in different languages:

    - In Ijo [Nigeria] and Ebrié (Kwa) [Côte d'Ivoire, Ghana], implosives pattern with obstruents synchronically (Williamson 1978; Bole-Richard 1983).

    - In Ikwere [Nigeria], implosives pattern with obstruents in some respects and sonorants in others (Clements and Osu 2002).

    - In Kru languages, implosives pattern phonologically with sonorants Kaye et al. (1981); Sande (2017).

- **Question:** What properties do implosives have such that they form a natural class with obstruents in some languages and sonorants in others?

- **Our goals:**

    1. To document the phonetic properties of consonants, vowels, and tone in Guébie, as part of the larger Guébie documentation project.

    2. To address whether there are acoustic or perceptual properties of implosives that are similar to sonorants in Guébie, which could explain the phonological patterning.

3   Experiment experience

We ran a series of production (acoustic) and perception experiments to learn more about the properties of implosives as compared to other consonants in Guébie.

3.1   Production experiments

The production experiments were designed to elicit a wide range of Guébie consonants, including obstruents, sonorants, and implosives.

- At the same time, we designed the word list to include all ten contrastive Guébie vowels with each of the 4 contrastive tone heights. In this way, we would be collecting production data on consonants, vowels, and suprasegmentals simultaneously.

- **Intended methods:**

    - *Participants*: 4 Guébie speakers (2 men, 2 women)
    - *Procedure*: participants heard a phrase in French and were asked to translate the phrase to Guébie and repeat it three times.
    - *Word list*: designed to elicit each consonant, tone, and vowel combination, controlling for preceding and following phonological environment.
    - *Carrier phrases*: created to have a controlled phonetic environment, including a pronoun used in analysis to control for duration measurements.

Challenges	Solutions

Participants

Men were much more willing to participate. Women tended to believe they did not have 'correct' speech, and therefore did not want to be recorded.	**Record in groups:** Women were more comfortable if they were recorded with a friend or family member during the task.

Procedure

Participants would frequently say the phrase only once instead of three times, and were tempted to give different constructions of the phrase in repetitions.	**Take the time to ask for clarification:** The researchers would ask the participants to repeat the phrases if they were not produced in the same construction. If participants showed frustration with the task, the researcher would move on to the next word and return to difficult words at the end of the task.

Word list

Participants tended to have multiple lexical items for the same French word.	**Prompt participants when necessary.** The researcher would provide the target Guébie word if a different translation was given, which often led to a discussion of the different semantic meanings of the words, or contexts in which each would be used.

Carrier phrases

In certain syntactic constructions, participants inserted a glide following the target sounds, making it difficult to measure where the target vowel ended.

Participants preferred to construct their own sentences containing the target words.

Prompt participants when necessary. Repetition is key! Work together with the speaker to come up with a sentence containing the target word in the appropriate phonological context, make sure they repeat it multiple times.

Recording conditions

Recordings were made in homes around the village. This typically meant recordings were made outside in noisy conditions, with children and animals frequently interrupting.

The more data, the better! Because of the noisy recording conditions, it is important to get at least 3 repetitions of each phrase per speaker.

Workflow

Alone, it was difficult to manage making sure that the speaker produced the target word in the optimal phonological environment while making clean recordings and taking notes about what was being said.

Multiple researchers present: Two researchers were present during the recording sessions. One took handwritten notes on the forms that were said in each session, and one was in charge of making sure the target segments were elicited. Back in the US, notes were used to compare what was said to what was elicited, to extract the correct target segments for acoustic measurement.

- **Major take-aways**:

  1. In running a controlled production experiment, design stimuli to collect consonant, vowel, and suprasegmental data simultaneously.
  2. Involve multiple researchers in all steps of the project.
  3. Record as much data as you can, paired with good notes, in order to end up with useful data for taking acoustic measurements.

3.2 Perception experiments

The perception experiments were designed to determine whether speakers perceive implosives more like obstruents or sonorants. The goal was to compare Guébie listener results to L1 English listeners, who do not have an implosive category.

- **Intended methods**

  - *Participants:* 20 Guébie speakers (20 English speakers' data was collected in a lab at Georgetown University)
  - *Stimuli:* Nonce words of the shape [aCa], where the C is either an obstruent, sonorant, or implosive.
  - *Procedure:* Two experiments were designed to compare sound similarity.
  - *Technology:* Stimuli were presented using the software PsychoPy. Participants heard a set of three sounds through headphones connected to a computer, and were asked to make a choice about which two sounds in the set were most similar.

* In one condition (ABX), participants heard two nonce words, followed by a third, which was the same as either the first or the second: [aba] [aɓa] [aba]. Listeners are asked to indicate if the third is the same as the first word or the second word.

* In the next condition (ABC) participants heard two words, followed by a third, which was not the same as either the first or second word, but listeners were asked to indicate which sound they think the third was most similar to.

* Participants were instructed to press '1' if they thought the third word was more similar to the first word in the sequence, and '2' if they thought the third word was more similar to the second word.

– *Instructions:* The researchers explained the task orally in French, and written instructions were provided on the computer screen via PsychoPy before the experiment began.

– *Results:* Results were compared with those of English speakers who completed the same set of tasks.

Challenges	**Solutions**

Participants

It was difficult to find participants who were willing to participate in an unfamiliar task.	**Recruit members of the community to help.** A consultant (who the researchers already had a working relationship with) helped recruit participants, and explain the task.

Stimuli and procedure

Participants were often distracted by the fact that the stimuli (nonce words) were not true Guébie words, but were similar to real words.	**Include training trials.** Before beginning the experiment, speakers were given 12 training trials of the same form of the test trials. Researchers sat with participants during the training to make sure the participants understood the task.
Some participants struggled with understanding the task; some always chose 2, some alternated between 1 and 2, some would pause and describe words in Guébie that were similar to the nonce words.	Results from speakers who completed the task incorrectly (e.g. always chose 1) had to be thrown out.

Technology

Participants were unfamiliar with computers.	**Design a task with a simple interface.** When the stimuli were played, participants saw a large '1' and '2' on the screen, and would light up when each stimuli played. Having a simple interface minimized the need for participants to be familiar with computers.

Instructions

Participants were often illiterate, and had varying French abilities

Recruit members of the community to help. Researchers gave instructions in French, and the community member gave the instructions in Guébie. Having a community member explain the abstract task made participants more comfortable with responding to the nonce word stimuli according to the instructions provided.

Results

Overall, Guébie participants had much higher error rates on the ABX condition than English-speaking participants run on Georgetown's campus. This is likely due to the lack of a quiet setting in the village, interruptions, and overall more discomfort and unfamiliarity with the task type.

Accept that it may not be possible to compare across listener groups. The task in Gnagbodougnoa is not comparable to a lab setting. Two different regressions were run for the English listeners and the Guébie listeners. Speaker groups' results can then be compared descriptively.

- **Major take-aways:**

  1. Collaborate with community members!
  2. Design experiments that will be familiar to your participants, or that have simple interfaces.
  3. Take time to ensure participants understand the task before proceeding to the testing phase; this will ultimately save time in the end.

4   Conclusions

- It is difficult to run controlled phonetic experiments in a fieldwork setting.

- However, there are strategies for overcoming the challenges:

  - If technology-based experiments must be used in areas where participants are unfamiliar with computers, tablets, or phones, be sure to design a particularly simple user interface.
  - If experiments that involve unfamiliar tasks cannot be avoided, build in training on the task before running the experiment, particularly in areas where participants have had very little formal education.
  - Recruit and train native speakers to run experiments, alleviating language, cultural, and comfort barriers.

- Ultimate benefits:

  - Typological understanding of range of variation of phonetic characteristics of sounds across languages.
  - Correlation of phonetic characteristics of sounds and phonological natural classes of segments.
  - Aids reconstruction and revitalization efforts.

- **Conclusion:** With some problem-solving and creativity, it is possible to include phonetic documentation in your documentation and description projects. We strongly encourage it!

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