

# Ejective Co-occurrence restrictions in Q'anjob'al \*

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## 1 Introduction

Q'anjob'al is a Mayan language spoken in Guatemala and parts of Mexico. There is also a significant population of Q'anjob'al speakers in Los Angeles.

This paper proposes that Q'anjob'al has restrictions against more than one non-identical ejective occurring in the same word. For example, there is a word *tz'otz'ew* [ts'ots'ew] 'mud', but I predict that no word such as *\*tz'oq'ew* [ts'oq'ew] could exist.<sup>1</sup>

Section 2 will briefly outline the phonology and orthography of Q'anjob'al. In section 3 I will describe my methods of analysing the corpora. I will then take a short detour into MacEachern (1999)'s observations on the cross-linguistic patterns of laryngeal co-occurrence restrictions in section 4. Section 5 will describe my conclusions, followed by a discussion of why the phoneme written *b'* and the glottal stop are not restricted in this way. The appendix gives further details of my methodology, for those interested in the programming aspects of this project.

## 2 Basic phonology

There is a (largely) phonemic writing system for Q'anjob'al which I will be using in this paper. Of interest to this discussion are the obstruents, given below in the Q'anjob'al orthography

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<sup>1</sup>All data is from the dictionary *K'ub'il yol Twitz Paxil (Vocabulario Q'anjob'al)* unless it is followed by bracketed numbers. The numbered data are from our class database compiled from interviews with our consultant, and the numbers indicate page number and datum number.

and their IPA equivalents.<sup>2</sup>

p /p/	t /t/	k /k/	q [q]~[χ]	ʔ /ʔ/
b' /p' / or /β/	t' /t'/	k' /k'/	q' /q'/	
	tz /ts/	ch /tʃ/	tx /tʃ/	
	tz' /ts'/	ch' /tʃ'/	tx' /tʃ'/	
	s /s/	xh /ʃ/	x /ʃ/	j /x/

Table 1: Q'anjob'al obstruents

Notice that every stop and every affricate has an ejective equivalent, with the possible exception of /p/. I will take up the matter of *b'* as we go. I will focus on the ejectives *t'*, *tx'*, *tz'*, *ch'*, *k'*, *q'*.

The sonorants of Q'anjob'al are /i/, /ε/ (e), /a/, /o/, /u/, /m/, /n/, /l/, /w/, /j/ (y), and /r/ (r).

### 3 Methodology

At first glance it seems that there are no co-occurrence restrictions on ejectives: data is littered with apostrophes. However, if the glottal stop and *b'* are removed from consideration, there are dramatically fewer words with more than one ejective, and even fewer with two or more different ejectives.

To test my hypothesis that Q'anjob'al might have restrictions on ejectives, I wrote a program in OCaml that, given a set of characters of interest (in my case, ejectives), searches through a string of text for words with any of those characters. It can be restricted to return only words with more than one of the characters, and even further restricted to return only words with occurrences of different members of this set.

In this study, I made a list of characters representing the ejectives. I searched the input for three different things: (1) words with any ejectives at all, (2) words with at least two ejectives, and (3) words with at least two different ejectives. I used two different inputs. The largest was a Q'anjob'al-Spanish dictionary, *K'ub'il yol Twitz Paxil (Vocabulario Q'anjob'al)*. The second was all of the ejective-containing data that our class has gathered so far. It should be noted that both likely contain some errors, our class data in particular, which has not been corrected in its electronic form since the data were double-checked. For more details on the methodology, please see the appendix.

### 4 Theory

MacEachern (1999) observes that many languages do not allow certain combinations of

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<sup>2</sup>It is not clear what the first sound, written *b'*, is. Phonetically, it looks very much like an bilabial ejective /p'/ (See Kaeli Ward's (2011) discussion) but we will see that at least in terms on co-occurrence restrictions, it does not pattern like the other ejectives

laryngeal features within the same domain (word, morpheme etc.) For example, Hausa does not allow glottals to co-occur with implosives or ejectives and does not allow two ejectives or implosives (or one of each) to co-occur either. However, there are no such restrictions on aspirated obstruents or /h/.

In contrast, Cuzco Quechua is much stricter. It has all the restrictions of Hausa, but also will not allow two aspirated stops, an ejective and an aspirated stop, or an aspirated stop and /h/. It only allows /h/ and /ʔ/, ejectives and /h/, and ejectives and /ʔ/.

Her proposal is that there is a hierarchy of similarity, and languages vary on how “similar” they allow these sounds to be within a particular domain.

These restrictions interact with an identity effect. For some languages, some or all of these restrictions can be violated in the case of identical consonants. That is, even though identity is as similar as possible by any definition thereof, languages that would not normally allow features to co-occur relax the restriction in the case of identity. For example, even though Hausa disallows two ejectives in the same domain, it allows it in the case of identity. That is, words like *ɓaɗa* are illegal, but *ɓaɓɓafii* ‘crumbs’ exists (MacEachern, 1999). However, Cuzco Quechua shows no identity effect: co-occurrence restrictions persist even in the case of identity.

## 5 Results

There are 5319 distinct words in the text of the dictionary *K’ub’il yol Twitz Paxil*. 1489 of them contain at least one ejective, excluding *b’*. (If *b’* is included the total jumps to 2396.) When the search is restricted to words with more than one ejective, we find only 139 words. Finally, a search for words with at least two *different* ejectives turns up a mere 27 words.

Similarly, there are 653 distinct words in the database. 203 of them contain ejectives. Only 10 have more than one ejective and of these 5 have two different ejectives.

These numbers are much lower than we would expect in the absence of co-occurrence restrictions. For example, /k’/ appears in the dictionary with the five other ejectives 16 times. However, /k’/ appears in the dictionary with five non-ejective stops and affricates /k, t, q, tx, tz/ 179 times.

I therefore conclude that Q’anjob’al has restrictions against two ejectives in the same domain – probably the domain of the word. I also tentatively conclude that there is an identity effect: two ejectives are licit if they are identical.

There is a great difference between the identity results from our own database (containing words from our own consultant) and those from the dictionary. Possibly this is a point on which dialects disagree.

The task, then, is to determine the status of these few apparent exceptions to a larger trend. Looking more closely at the 10 putative examples of words with two ejectives (identical or otherwise) from the database, we immediately find that over half are transcription errors that were not corrected in the electronic version of the data. The remainder are these:

- (1) a. tz'otz'ew  
mud
- b. No' hin kak'on tx'i' **ch'ek'** xuyuyooq no'  
CL my two dog ?? run? CL  
'My two dogs run a lot.' (LM March 8)
- c. stzewi heb' i **ch'oq'** heb' masanil  
laughed they and cry they every  
'Everyone laughed and cried'
- d. Xin **k'ilaqnuq'**.  
c-1s cough  
'I coughed.'

I have not been able to find b-d anywhere else to double-check them.

The 27 examples from the dictionary of words that have two different ejectives seem likely to tell a similar story. The few that I have been able to check with Alejandra were rejected as given, and versions without two ejectives were given instead. For example, the text of the dictionary includes *\*sch'ik'il*. Alejandra recognised it as intending to say *schik'il* 'blood'. Whether this is a dialect difference or an error in the dictionary I do not know.

I predict that when the rest of these anomalous words are checked we will find that they do not exist as I have them, at least not in Alejandra's dialect. Further research will determine whether I am correct in this prediction.

## 6 B' and ?

Neither *b'* nor ? patterns with the ejectives discussed above. In the dictionary, *b'* can co-occur freely with ejectives. There are 294 words (18%) with *b'* and one of the six ejectives. This is in contrast with, for example, *k'* which occurs with other ejectives only 16 times. Examples: *jab'ch'an* 'very little', *b'utz'an* 'a bit of powder', *b'aq'sat* 'eye', *b'ayk'altet* 'any', *xhulq'ab'* 'whistle'. A similar but weaker effect occurs in our database, where 27 of 653 words (4%) have *b'* co-occurring with ejectives, but only 4 (0.6%) for all ejective co-occurrences combined. Examples include *kab'ch'an* 'few' (142:24), *k'ub'il* 'hide' (129:28), *ch'elob'noq* 'make' (as in 1 and 2 make 3) (35:5). I conclude that whatever it may be phonetically, phonologically, *b'* does not pattern as an ejective.

Similarly, ? occurs freely with ejectives. There are 147 words in the dictionary with ? and an ejective. When *b'* is included, there are 215. Examples include *aq'a'* 'deliver', and *wak'a'* 'plant stakes'.

My findings support MacEachern's hypothesis. In order of "similarity", (where *similarity* is hypothesised to be acoustic (p. 145), these are the relevant sounds pairings:

1. ?, implosive
2. ?, ejective
3. ejective, implosive

#### 4. ejective, ejective

If *b'* is treated as an implosive, I can claim that Q'anjob'al makes its acceptability cut-off between (3) and (4), making ejective co-occurrence illegal but any other laryngeal pairings legal. There is also an identity effect, making identical ejectives legal in the same domain.

## 7 Conclusion

I predict Q'anjob'al to disallow more than one ejective in a domain. Further research will clarify the exact nature of the domain. It appears to be the word, but compounding seems to license co-occurrence, as in (2)

- (2) a. k'ul  
stomach/feeling
- b. tx'um.k'ul  
pain.stomach  
'stomach cramps'
- c. Watx'.k'ulal  
good.feeling
- d. nuq'.  
neck
- e. Xin k'ilaq.nuq'.  
c-1s cough  
'I coughed.'

Further research is needed to determine whether the few examples of ejective co-occurrence are accurately recorded. Dialectical differences may also enter into the equation.

## 8 Appendix: method details

The program was written in a functional programming language, Objective Caml. The basic idea was to split a word into a list of its characters. These characters can then be arguments to recursive functions that can search through them for anything you want; in this case, whether they belong to a pre-given list of characters of interest (ejectives, glottals, and *b'*, in this case). There is also a function that turns a string of words separated by spaces into a list of the words.

These functions, then, given a string like (3-a) would first return (3-b) and then (3-c).

- (3) a. "Chwochej Q'anjob'al"
- b. ["Chwochej" ; "Q'anjob'al"]
- c. [("Q'anjob'al", ["Q"; "'"; "a"; "n"; "j"; "o"; "b"; "'"; "a"; "l"]);  
("Chwochej", ["C"; "h"; "w"; "o"; "c"; "h"; "e"; "j"])]

Notice that the symbols that stand for ejectives are being split up by this function. For example, Q' becomes [Q; ']. The input text therefore needs to be modified, which can be done in a word processor. For this project, I used the word processor to make everything lower case, freeing upper case letters to stand for digraphs. I then replaced all digraphs with single letters. For example, b' → B, ch → c, ch' → C etc. I also removed all carriage returns, punctuation, etc., which is easy to do with find-and-replace functions. The result was just a string of words separated by spaces, which then acted as the input to my program.

I then wrote functions that would return words and the ejectives they contain, another function that restricted the output to only multiple ejectives, and yet another that restricted that one to words with two or more different ejectives.

If the co-occurrence restriction were absolute and if there were no errors in the input texts, we would expect the output of the last function to be empty. As discussed, however, it is not empty, but is indeed very short.

Sosa López et al. (2003)

## References

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