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A moraic and a syllabic H-tone in Yucatec Maya

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1. Introduction

Yucatec Maya syllables have the structure CV(V)(C), i.e. the onset is obligatory and vowels are short or long. There are no diphthongs, other than post-lexical ones arising from [h]/[ʔ]-deletion between vowels. Syllables with short vowels are referred to as ‘short’ (also: light, l), while syllables with long vowels are ‘long’ (also: heavy, h). The segment systems are given in (1) and (2).

(1) p p' b t t' k k' ʔ
 ts ts' tʃ tʃ'
 s ʃ h
 m n ŋ
 w l j

(2) i u
 e o
 a

Long syllables come in three types from the point of view of the word prosody, Long High syllables, marked *áa*, Long Low syllables, left unmarked as *aa*, and Glottalized syllables, marked *a'a*. Examples of monosyllabic words are given in (3) (Pike 1946).

(3) Short ʔek ‘wasp’
 Long High kóot ‘wall’
 Long Low ʔaak ‘turtle’
 Glottalized ku'uk ‘squirrel’

Glottal stops, ejectives and glottalized vowels are freely combinable, as in ʔe'el ‘egg, testicle’, k'i'ik ‘blood’, ts'u'uts ‘kiss’, p'áaʔ ‘open slightly’, ʔiʔ ‘hawk’, k'ak' ‘dry up’. While onsets can be interpreted as obligatory, with /ʔ/ present as a phoneme (Bricker et al. 1998), Blair & Vermont (1965) assumed that the glottal stop was a default consonant in vowel-initial words. Words, which can be monosyllabic or polysyllabic, have an obligatory final consonant. Post-lexical deletion of word-final glottal consonants [h] and [ʔ] is common.

Long syllables tend not to be adjacent in the same word, *síináan* ‘scorpion’ being a rare exception. Words with two short syllables never have a medial [ʔ]. Since disyllabic structures with short vowels typically have the same vowel in both syllables, as in *mukuj* ‘turtle dove’, the question arises whether *v'v* is not to be interpreted as *VʔV*. An important argument for a monosyllabic

interpretation is that a reduplication process that targets first syllables reduplicates CV?V(C) rather than CV.

The phonetics and phonology of the tones of Yucatec Maya are less than clear. Blair & Vermont (1965) observe that the realization of Long High depends on the position of the syllable in the intonation phrase. In final position, a fall is produced, but in penultimate position before a neutral syllable, the tone tends to be high, with the low pitch being produced on the final syllable. Unfortunately, such context-dependent variation is not presented in Fisher (1976), which gives F0 curves of isolated monosyllables. In addition, doubts are raised about the lexical status of the pitch contrasts by Archibald (1996).

There are no reliable statements on the word stress in the language. Our tonal analysis suggests that the prosodic syllable types listed in (3) are stressed syllables. This may also be the reason why the occurrence of two long syllables in the same word is rare, certainly if they are adjacent. The reason for assuming this is that only long syllables and short word-initial syllables acquire tone, suggesting that the stressed syllable is the domain for tone association. As we will see, in a word like *mukuj*, only the first syllable is a one-bearer.

This contribution intends to present the phonetic and phonological facts of the Yucatec tones. In particular, we will not just present the facts as applying to the four syllable types when said in isolation, but to take into account any effects of position in the sentence, tonal context, and focus. Section 2 discusses the rationale for the variables we have included in the corpus,

2. Anticipating contextual variation

In order to determine the phonological structure of the tones of Yucatec Maya, we need a phonetic description of the prosodic syllable types in different contexts. First, if the language is comparable to European intonation languages with pitch accents and boundary tones, we should expect variation in syllabic pitch contours as a function of position in the sentence. For instance, the English syllable *John* tends to be pronounced with rising pitch in *JOHN will know BETter*, with high level pitch in *THAT must be JOHN there*, and with falling pitch in *THAT will be JOHN*. We are therefore interested in the realization of the prosodic syllable types in phrase-final, phrase-penultimate as well as phrase-initial position.

Second, if the language is similar to pitch accent languages like Japanese, downstep may be anticipated. Languages with downstep vary in the context in which downstep applies (cf. Gussenhoven, 2004: 103). In Yucatec Maya, we might expect either H or HL to trigger downstep, and all tones, or just H-tones, to be downstepped, if they occur in some domain together with the trigger.

Third, if processes like downstep exist, the domain within which the target and the trigger are located may be crucial. Moreover, if the language is like an African tone language, spreading or displacement effects may be anticipated within certain domains, like the NP or the VP. This suggests that in order to be able to compare the pronunciation of the four prosodic syllable types in tonal contexts are distributed differently over syntactic or prosodic domains, it

would be useful to combine the nouns with both adjectives and verbs in otherwise equivalent contexts.

Fourth, in addition to morpho-syntactic and phonological factors, there may be an influence of information structure on the realization of the tones. Many languages express information structure in the prosodic structure, for instance by deleting pitch accents on words outside the focus constituent, as in English (cf. Ladd 1996), by having different pitch accents for informational and corrective focus, as in Portuguese (Frota 2000), or adjusting the prosodic phrasing, as in Japanese or Chichewa (Pierrehumbert & Beckman 1988, Kanerva 1989).

Finally, we might anticipate different pitch contours with interrogative sentences, as a result of either the presence of an interrogative high boundary tones or of a raised pitch register. Yucatec Maya interrogatives are formed by the addition of the question particle *waaj/waah*, in which case the pitch contour is the same that used for the declarative. Alternatively, a phrase-final rise is superimposed on the pitch contour of the declarative, causing all final syllables to rise (Blair & Vermont 1965). The phonological and phonetic effects of this rise may interact with other factors, like focus.

3. The corpus

Two sets of four monosyllabic nouns denoting animals and objects were chosen to represent the four prosodic syllables. It proved to be impossible to find minimal quadruplets, i.e. sets of four words that were identical except for the prosodic syllable type. We were however able to balance the two sets, such that words in set A had voiceless onsets, the vowel [a], and sonorant codas, while the words in set B had sonorant onsets, the vowel [i] or [e], and voiceless codas. Unfortunately, the word representing the short vowel in set B, *mis* ‘muscle’ (Bricker et al. 1998), was pronounced *miis* by the first subject, and it was decided to replace it with *us* ‘gnat’. These sets are given in (6).

(6)	A		B	
	<i>kaj</i>	‘fish’	<i>us</i>	‘gnat’
	<i>k’áan</i>	‘hammock’	<i>míis</i>	‘broom’
	<i>kaan</i>	‘snake, worm’	<i>miis</i>	‘cat’
	<i>ka’an</i>	‘sky’	<i>me’ex</i>	‘beard’

The corpus contained the conditions in (7), where X represents the nouns in (6). By comparing (7a) and (7b), we hope to be able to answer the question whether the syntactic structure, specifically the difference between NP and VP, is relevant to any interaction between tones. A comparison between (7b) and (7c) will reveal any allophony between tones due to the variation between phrase-initial and phrase-final positions. (7c) represents a topicalization of the object, and it will not share the same syntactic phrase with the verb as it does in (7b). While the nouns are therefore appropriately provided with the same prosodic boundary, on the right and on the left respectively, their syntactic boundaries at their opposite edge will not be the same, which is VP-internal in (7b) and (VP-external in (7c). However, this difference is unavoidable, and is moreover unlikely to affect the pronunciation significantly. Impressionistically, the prosodic break between the topicalized object and *kin* in (7c) is no different from that between the verb and the object in (7b). Next, a comparison between (7b,c) on the one hand and (7d) on the other should reveal any allophony due to the

variation between phrase-peripheral and phrase-internal positions (cf. the observation made by Blair & Vermont 1965). Subcorpus (7d) uses the demonstrative *le Noun-o'* in order to place the experimental syllable in phrase-penultimate position. Finally, (7e) and (7f) represent the largest possible difference in information structure. (7e) places the nouns of (6) in a corrective context as provided by the equivalents of English sentences like *I don't see a squirrel, I see a cat*, while (7f) is like *I'm not writing 'cat', I'm saying 'cat'*. As shown by the latter sentence, in a number of cases the Nouns have metalinguistic referents, i.e. the words concerned. However, there is no indication that metalinguistic reference and ordinary linguistic reference are treated differently, either in English or in Yucatec Maya. As will be clear, the *Y* in (7e) was a semantically related noun to the *X* concerned, while *Verb_i* was semantically related to *Verb_j* in (7f).

- (7) a. NP: Adj X
 b. VP: *Kin Verb X* 'I Verb X'
 c. Topicalization: *X kin Verb*
 d. Penultimate: *Kin Verb le X-o?* 'I Verb that X'
 e. New Information: *Ma kin Verb_i Y, kin Verb_i X* 'I don't Verb_i X, I Verb_i Y'
 f. Given Information: *Ma kin Verb_i X, kin Verb_j X* 'I don't Verb_i X, I Verb_j X'

The adjectives and verbs that were used in the sentences in (7) represented the four syllable types illustrated for the noun in (6). For the long high adjective, we used the ordinal 'first'. For morphological reasons, the adjectives were monosyllabic, while the verbs were disyllabic. The verbs were chosen such that they combined relatively easily with the nouns, for which reason we chose verbs of perception as well as verbs that allow the metalinguistic use of the words in object position, like 'write'. The corpus in (7) consisted of 2 (sets of nouns) times 4 (syllable types for noun) times 4 (syllable types for adjective or verb) times 6 (sentence types), or 192 sentences.

- (8) *sak* 'white' *wilik* 'see'
 jáax 'first' *ts'ú'tik* 'write'
 boox 'dirty' *meentik* 'make, do'
 ja'ax 'green' *cha'antik* 'look at'

Additionally, a subcorpus of interrogative sentences was created by providing the sentences in (7b) with question marks, in order to solicit question intonation.

4. Procedure

Each of the 192 sentences were written on a slide of a powerpoint presentation in the spelling as used here, and ordered such that repetitions of experimental conditions or nouns were avoided. To minimize the risk that speakers might misinterpret the spelling for the noun, a picture was included for each noun in the right-hand corner of the screen. In one case, we replaced the word *k'áan* 'hammock' with *paay* 'skunk', as we were worried the spelling might not be sufficiently distinct from that of *ka'an* 'sky'. A separate powerpoint presentation was prepared containing just the 32 sentence in (7b), where each sentence was provided with a question mark.

Four male speakers aged between 25 and 50 were recruited from the Maya community in the Bay Area, all of whom were raised in Maya speaking families in or around Oxkutzkab. Speakers were

given an instruction sheet and a print-out of the corpus about a week in advance. In the instruction (included as an appendix), they were asked to familiarize themselves with the sentences before coming to the recording session. Recording sessions began with a practice session with a block of some 20 sentences selected randomly from the test. Speakers were asked to read the sentence on each slide twice, and to go on to the next slide only when they felt they had read it right twice. Each sentence was provided with a number, which speakers were asked to read out before saying the sentence. They were monitored during the recording session, and asked to repeat items whenever any disfluencies or listing intonations were suspected. One of the four speakers also read the Question corpus. Recordings were made with the help of a Marantz digital audio recorder PMD680. Recordings were made in the sound treated studio in the Phonology Lab of the Linguistics Department of UC Berkeley in two cases (O,W), and in two other cases in quiet rooms in Palo Alto (S) and San Francisco (D) in November and December 2005. Speakers O and W divided their recordings over two sessions separated by several days.

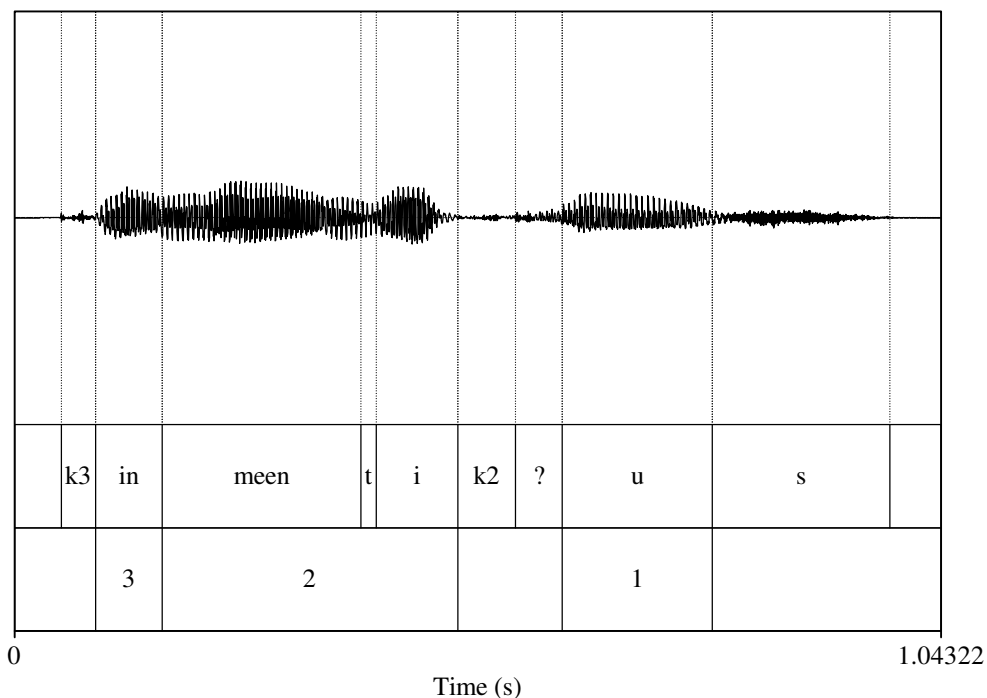


Figure 1. Example of segmentation of a sentence, with enabling duration and F0 measurements of various sections of the speech file.

4.1 Measurements

One of the readings of each sentence by each speaker was selected for further processing, and stored as a separate speech file. We segmented each such utterance twice, once for the purposes of segment duration measurements, and once for the purposes of F0 analysis. Nouns were fully segmented, while for other words voiceless and voiced portions were separated. Figure 1 shows how this was done for *Kin meentik us* ‘I am making a gnat’ by speaker S. The first segmentation is more detailed and allows us to calculate durations of various segments in the experimental words.

The second, coarser segmentation allows us to calculate F0 at regular points across crucial sections of the speech wave file, like the voiced portion in the experimental words. The time points represent 5%-increases relative to the preceding time point. The first measurement point corresponds to 5% of the total duration of the rhyme after the beginning of the rhyme. The analysis was done with the help of the speech package Praat (Boersma & Weenick 1999-2006), using labelling and measuring scripts produced by Joop Kerkhoff and Jörg Peters.

5. Results

5.1 Phrase-initial vs phrase-final

A comparison between the results of (6b) with those of (6c) will allow us to see whether the F0 contours of the experimental words is in part determined by intonational boundary tones. Figure 2 presents the average F0 at 10 time points over the voiced portion of the words in set A for speaker O. As observed in section 4, the time points represent 5%-increases relative to the preceding time point.

There are two effects that can be seen. First, phrase-final occurrences are lower than phrase-initial occurrences. This effect is to be attributed to the fact that earlier portions of utterances generally have higher f0 than later ones. The effect may be due to declination, a general, time-dependent lowering of F0, or final lowering, a lowering of the final portion of utterances, possibly augmented by a phonologically triggered lowering known as downstep ((Lieberman & Pierrehumbert 1984, Ladd 1984, Gussenhoven 2004: ch 6). Second, in at least one case, the general shape of the contour is different in the two positions. This is most clearly so for the Long High condition, *páay* (speaker O) and *k'áan* (Speaker W). In phrase-initial position, a rise occurs, while in phrase-final position a fall is seen. This allophony is striking when compared with the constant general shape of the Glottalized condition, represented by *ka'an*. However, there is allophonic variation of a different nature in the case of the Glottalized syllables. In phrase-final position, the glottalization is actually there, in the form of very marked creak, variably realized with a glottal closure of some length, or as a mode of phonation which could equally be characterized as a sequence of very brief glottal stops.

Table I. Positional variation for four prosodic syllable types

	<i>Short</i>	<i>Long High</i>	<i>Long Low</i>	<i>Glottalized</i>
<i>Final</i>	Low	Fall	Low	Fall, glottalized
<i>Initial</i>	Low	Rise	Low	Fall

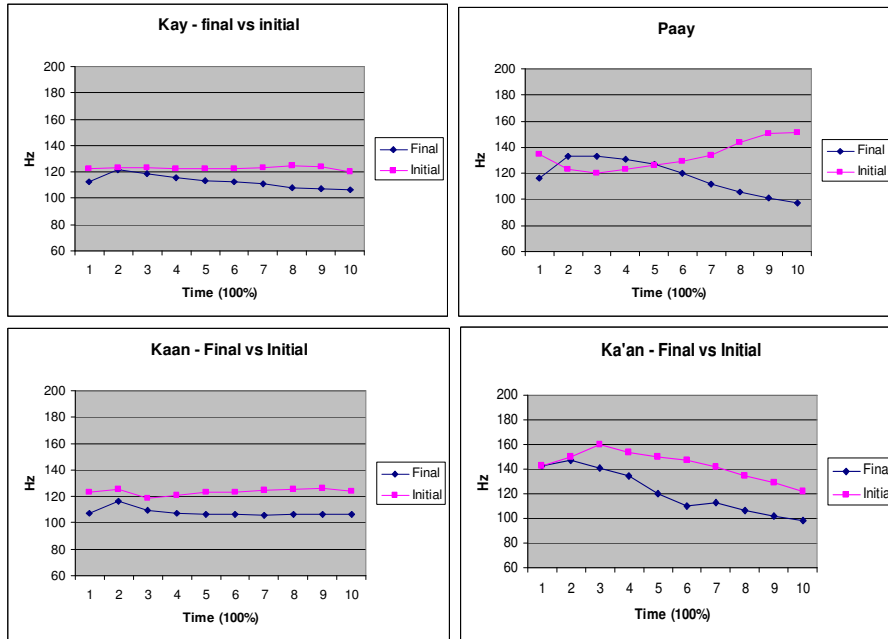


Figure 2. Mean F0 tracks of the rhymes of *kay*, *páay*, *kaan* and *ka'an* in phrase-initial and phrase-final positions. Normalized time scale. Speaker O. n=4.

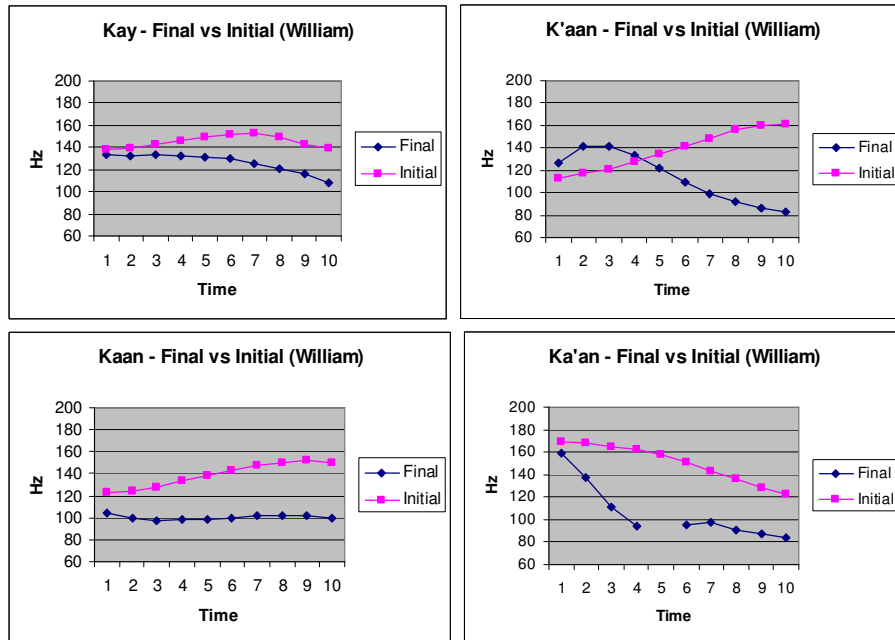


Figure 3. Mean F0 tracks of the rhymes of *kay*, *k'áan*, *kaan* and *ka'an* in phrase-initial and phrase-final positions. Normalized time scale. Speaker W. n=4.

It is not hard to see the motivation behind the allophonic distribution. In phrase-final position, the difference between Glottalized and Long High plays out as a contrast between a glottalized and a plain-voiced fall. In phrase-initial position, the contrast is one between a plain-voiced fall (Glottalized) and a plain-voiced rise (Long High). The pronunciation of Short and Long Low is relatively constant. As observed above, the lower pronunciation in phrase-final position is due to a downtrend, whose nature we are still to determine. The more striking difference is between the two speakers. Speaker W tends to have a weak rise for Long Low in phrase-final position, undoubtedly a recent development, and one we will ignore for the moment. The data for the other two speakers generally agree with speakers O and W, but the final rise in Long Low does not reappear in either of the other two speakers.

The variability in the pronunciation of the Long High also makes its appearance in the penultimate position. With normalized time scales, the contours for the three other tones look fairly stable. If we assume that tones associate with stressed syllables, and that the stress in e.g. *le kayo'* is on the first syllable (a non-obvious assumption from a phonetic perspective). The F0 contours are very similar indeed, except in the case of the Long High, where the peak is relatively late in the penultimate condition.

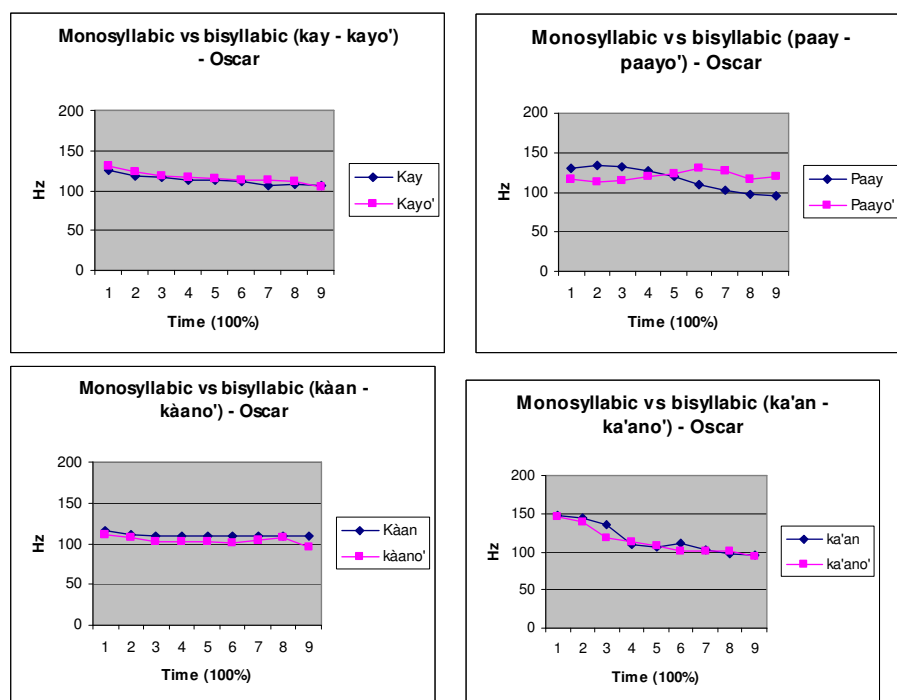


Figure 5. Mean F0 tracks of the rhymes of *kay*, *páay*, *kaan* and *ka'an* in phrase-penultimate position (*le --- o'*) and phrase-final positions. Normalized time scale. Speaker O. n=4.

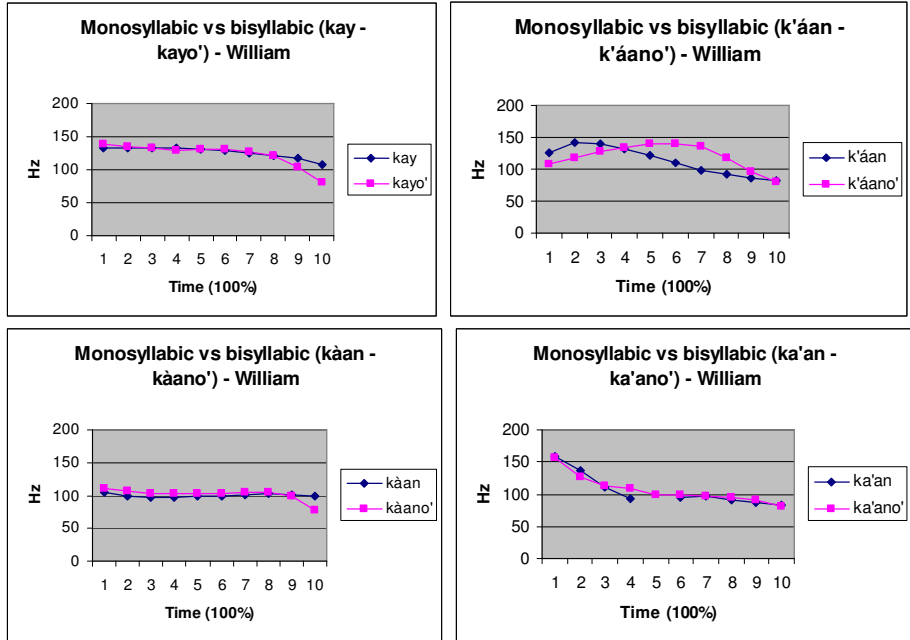
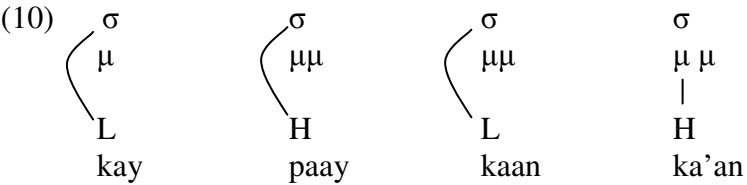
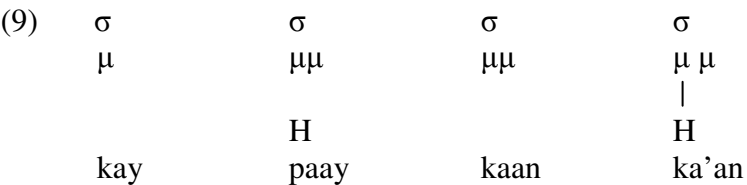


Figure 6. Mean F0 tracks of the rhymes of *kay*, *k'áan*, *kaan* and *ka'an* in phrase-penultimate position (*le* --- *o'*) and phrase-final positions. Normalized time scale. Speaker W. n=4.

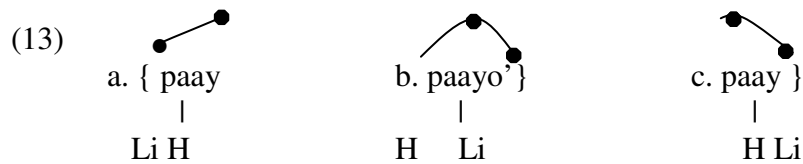
A phonological analysis of the allophonic differences in Table I faces the challenge that, from the point view of their realization in phrase-final position, Long High and Glottalized both present with a falling contour, the only difference being that Glottalized has glottalization. A solution to the problem should be such as to explain why, in phrase-internal position, Glottalized retains a fall, while High Long changes to a rise. It is proposed that, from a phonological perspective, these facts are explained by a difference in the Tone Bearing Unit between Glottalized and other syllables. Only in Glottalized is the H-tone pre-linked to the mora (μ). All other syllables only offer the syllable node (σ) as the TBU. Assuming, then, that (9) gives the lexical representations, the assumption that the stressed syllable is the TBU (11) and that unspecified syllables acquire a L-tone, the surface representations (or lexical representations in Lexical Phonology) are as in (10).



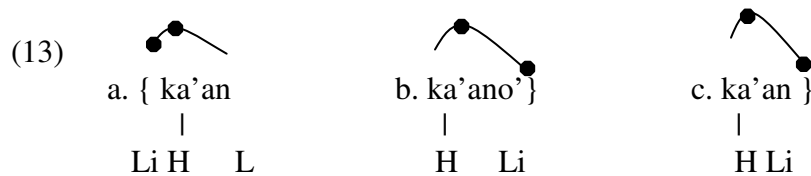
(11) TBU: ${}^1\sigma$

(12) DEFAULT L: $\uparrow\sigma$
 |
 L

The representation in (10) essentially gives us the word as well as the sentence prosody of Yucatec Maya. The variability in the location of the peak is due to the presence of initial or final boundary tones in the syllables concerned. The syllabic H-tone makes room for the boundary L, so as to occur late in (13a), earlier in (13b) and earliest in (13c). Observe, too, that glottalization is simply derivable from the context in syllables with a moraic H-association in final position in the intonational phrase.



By contrast, the H-tone in the Glottalized condition is firmly anchored on the first mora of its syllable, given the situation in (14). The initial Li in (14a) is truncated.



As is generally the case in East-Limburgian dialects of Dutch (Gussenhoven 2004:c28), the empty mora in (13) will associate with a L-tone, one of which will always follow, either as a final boundary tone or as a default L-tone (see also section 6). The Low and Long Low conditions would appear to be straightforwardly accounted for by assuming the L associated to the syllable.

5.2 Downstep after H

The issue in this section concerns the effect of one tone on the other. There are several effects we might expect. If something like downstep exists, the lowering effect that we have seen in Figures 2 and 3 is not uniform, and depends on the representation. There are three ways in which such non-uniformity could play out, given what we know about downstep rules in languages generally. The first is that should be lowering is more extreme after one tone than after another. For instance, H-tones are known to cause downstep on other H-tones in many language. Second, it may be that downstep affects some tones, but not others. Again, it is much more common for H-tones to be downstepped than it is for L-tones or M-tones to be so lowered. And third, given that one or both of the above regularities holds, the issue arises whether the downstep is confined to some smaller domain within the obvious largish domain of the intonational phrase. (We are aware that downstep occurs at the level of the phrase, causing phrasal lowering; but we are here concerned with intra-

phrase downstep affecting single tones.) For Yucatec Maya, the answers to these questions are yes, no, and no.

Let us first show there is an effect of preceding tones. To this end, we averaged the F0 contours in each set of words for each speaker separately over all prosodic syllable types, with normalized time scales as before, but separated these for preceding tone. We averaged across the conditions (7a) and (7b), so that N=8. The results for sets A and B for four speakers are given in Figure 7a and 7b, respectively. For all four speakers, the mean F0 is lower after Glottalized and Long High adjectives and verbs than after Short and Long Low adjectives and verbs. The difference is particularly pronounced for speaker W, whose mean difference is around 25 Hz, but the others too make a difference, with sizes in the order of 8 to 15 Hz.

What this means is that Yucatec Maya has downstep triggered by H-tones. By implication, this regularity constitutes evidence for the correctness of the analysis in (9) and (10), since it characterizes the downstep trigger as a natural class.

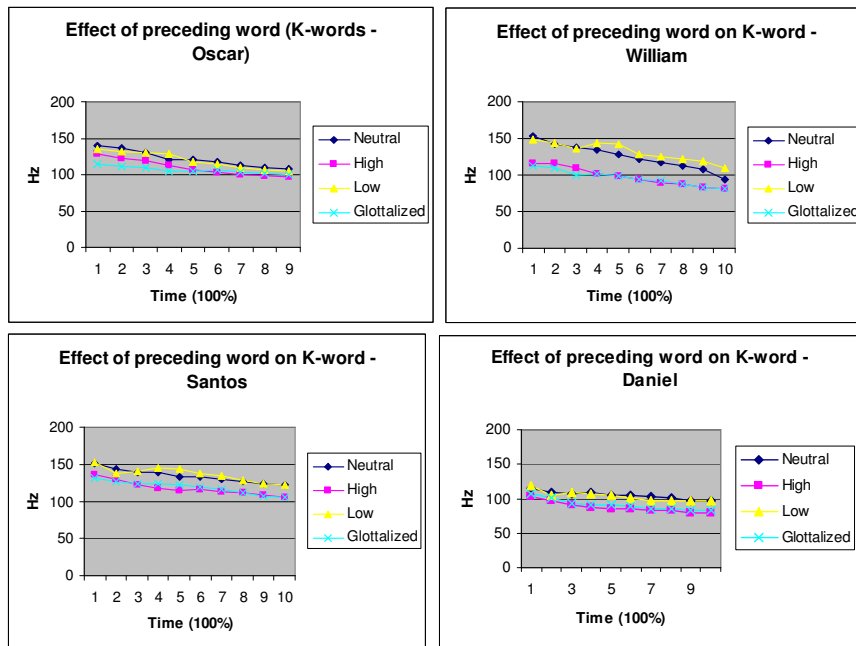


Figure 7a. Mean F0 tracks of the pooled rhymes of *kay*, *k'áan*, *kaan* and *ka'an* in phrase-final position as a function of preceding prosodic syllable type. Normalized time scale. Speaker O, W, S, D. n=8.

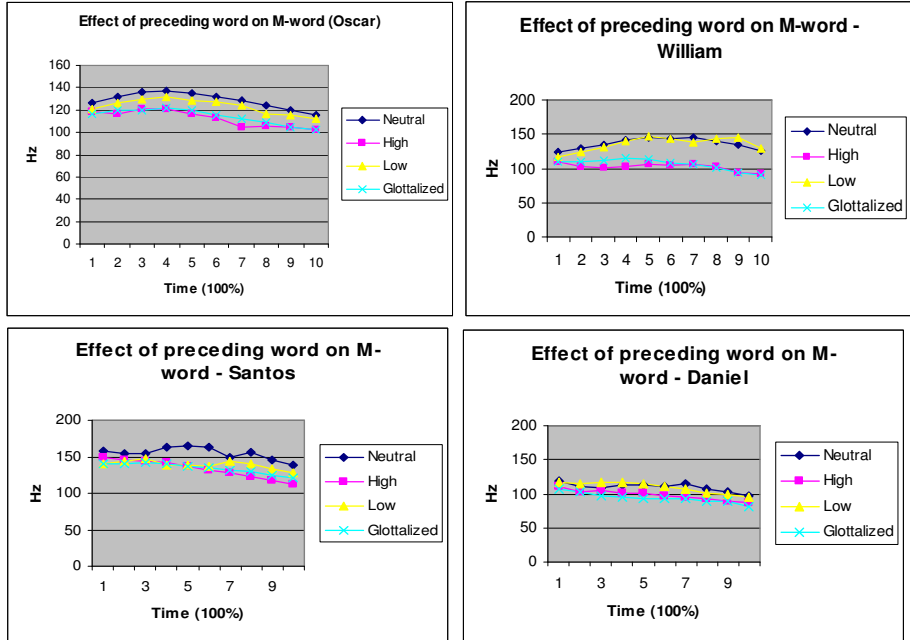


Figure 5b. Mean F0 tracks of the pooled rhymes of *us*, *müs*, *miis* and *me'ex* in phrase-final position as a function of preceding prosodic syllable type. Normalized time scale. Speaker O, W, S, D. n=8.

Second, in order to see if the lowering effect is dependent on the phonological representation of the trigger, we separated the F0 contours of the Low and Long Low words in set A and the Long High and Glottalized words in the same set, and averaged the data across the conditions with preceding adjectives and verbs, separated for tone type: we pooled across Glottalized and Long High as well as across Short and Long Low. The results are presented in Figure 8, for four speakers, and suggest that the both L-toned targets and H-toned targets undergo the downstep effect equally. The consistent nature of the data leaves no doubt as to the regularity of this effect. In other words, the language has the downstep rule in (14).

(14) YUCATEC MAYA DOWNSTEP $T \rightarrow !T / \{ \dots H \text{ --- } \dots \}$ (Implementation)

As in all downstep cases, we are assuming, with Pierrehumbert (1980), that downstep is a rule of phonetic implementation applying to phonological features in a specific phonological environment. That is, it is a rule of the pronunciation, creating allophonic effects.

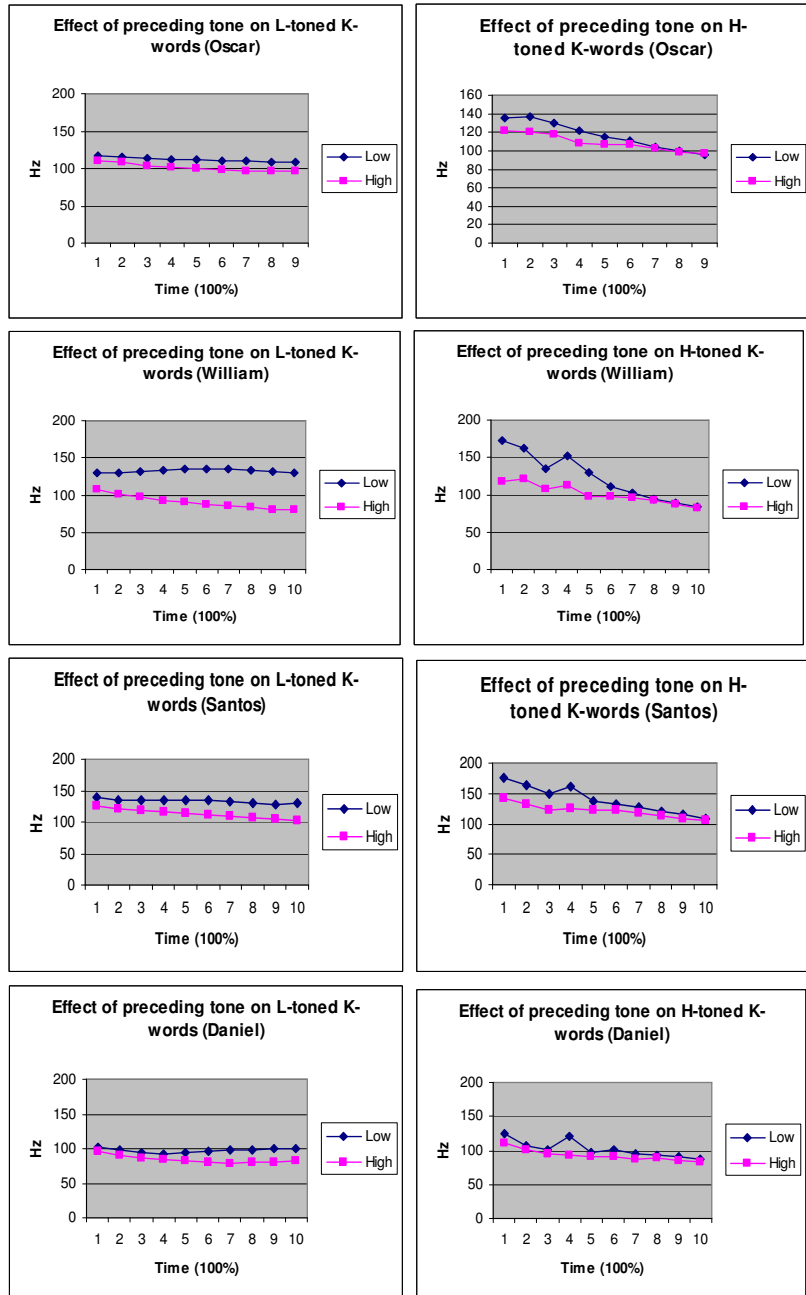


Figure 8. Downstep on L-toned and H-toned nouns by H-toned and L-toned triggers separately, for speakers O, W, D and S.

Third, we separated the data according to the word class of the preceding word. There is no difference between the data for the NP (7a) and those for the for VP (7b). Rule (14) then is as general as it has been formulated there.

5.3 Old and new information

A comparison between (7e) and (7f) will allow us to establish any effect of information structure on the F0 of the experimental nouns. Kügler and Skopeteas (2006) observe on the basis of a number of utterances that focus does not in fact have a prosodic effect on the pronunciation of words. In particular, they observe that no pitch accents are used to mark focus, as is the case in English and German. In Gussenhoven (2006), I presented a comparison between (7e) and (7f) for set A by speaker O, which showed that the pronunciation of the final noun in the two conditions is identical. The duration of final nouns in condition (7e), where they occur in a position of Corrective focus, does not differ from that in condition (7f), where the nouns occur as Given information. Moreover, the F0 contours were the same too. We supplement those data here with the equivalent data for set B in Figure 9. Again, there is virtual complete overlap of the data point, even over as few as four measurements.

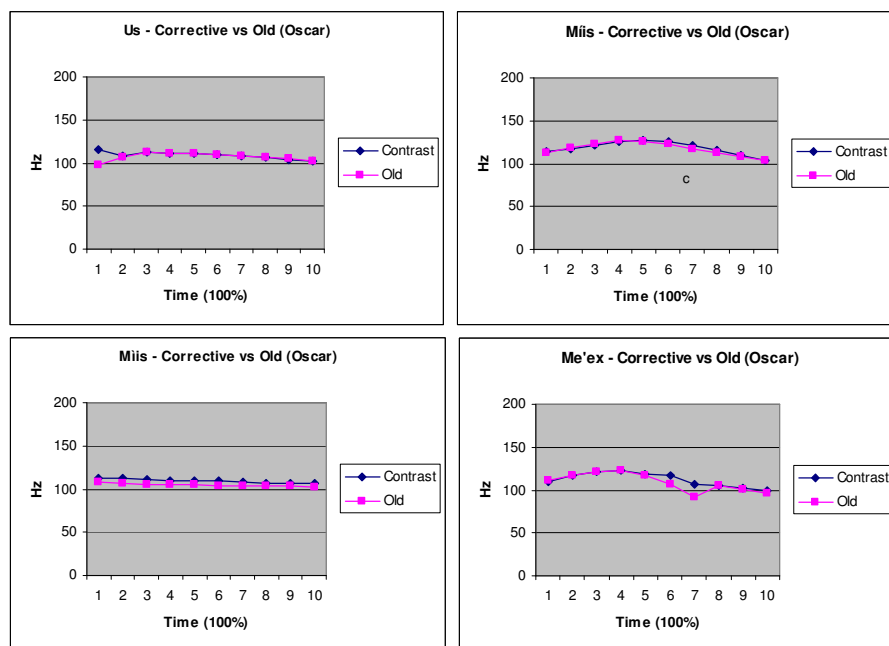


Figure 9. Mean f0 tracks for *us*, *míis*, *miis* and *me'ex* for speaker O under Corrective and Given focus. N=4.

The data for the other speakers for both word sets are essentially the same as those in Figure 9, with one exception. Speaker W shows an effect that could be interpreted as hyperarticulation in the Corrective condition. This applies to the pronunciation of the Long High in set B, where *míis* has a later peak in the Corrective condition. Arguably, the pronunciation in that condition is more careful in that low pitch is used to throw the peak into relief, or perhaps more probably, the late peak is here used to signal emphasis (Gussenhoven 2004: 90).

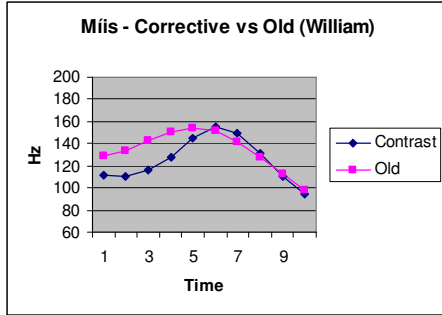


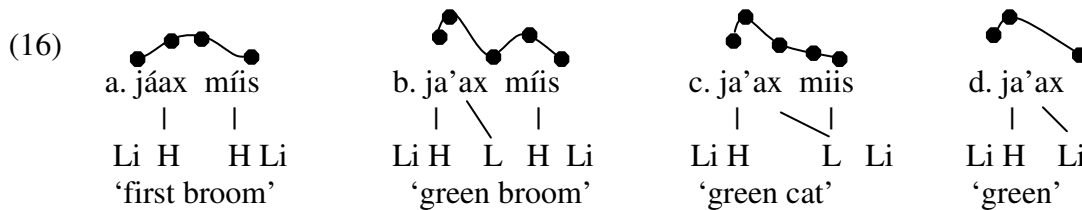
Figure 10

6. Default L's at the sentence level

The sentence prosody is completed rule (15).

(15) L-INSERTION $\emptyset \rightarrow L/H \text{ --- } H$

That is, any sequence of H-tones generated by the choice of Glottalized and Long High words will be broken up. In addition, we may assume, in view of the constant fall in Glottalized syllables, that the second mora of those syllables associates with a L-tone, of whatever origin. If the L is a lexical L, it will have a double association. In fact, the assumption of moraic TBU's makes the generalization in (15) at all possible. Crucially, no L is inserted between H's if no free syllable or mora intervenes. That is, in a case like (16a), no L intervenes between the H-tones, there being no intervening empty syllable or mora. Notice that this puts a semantic burden on \emptyset which we would not otherwise assume, which is that in the position of \emptyset it ought to be possible in principle for a tone to occur. That is, no L must be inserted between adjacent tone-bearing syllables. Thus, in (16b), we have an empty mora between the H's. In (16c) the L on the second mora is provided by the doubly linked L of *miis*, and in (16d) by the boundary Li.



In (17) some further cases are shown. (17a) is an all-L utterance, while (17b) shows a H-toned word followed by a L-toned word, with an intervening syllable. This example shows that not all syllables are TBUs, since the L of *kaan* does not associate with unstressed *-tik*. This is shown by the high pitch of *-kin*, due to the lingering H of *ts'ii'tik*. The relevant comparison here is with (16c), where the L does associate to the empty mora of *ja'ax*. In (16c), the inserted L will, however, cause *-tik* to be low-pitch, as it would otherwise not have a realization. The example shows that we cannot assume that the space between the H's is bridged by a sagged contour given some distance between the targets of H, but that a phonological tone is inserted, requiring realization. In (16d), we see the inserted L associating with the second sonorant mora of *K'áan*, causing unstressed *kin* to be

low-pitched, as it is the continuation of the L on the second mora of the preceding Glottalized syllable.

- (17)
- a. Kin meentik miis
 | |
 Li L L Li
 ‘I’m making a cat’
- b. Kin ts’íi’tik kaan
 | |
 Li H L Li
 ‘I’m writing “snake”’
- c. Kin ts’íi’tik ka’an
 | | |
 Li H L H Li
 ‘I’m writing “sky”’
- d. K’áan kin cha’antik
 | | |
 Li H L H Li
 ‘A hammock I’m looking at’

Since there are now potentially L-tones between the H-tone that triggers downstep and the tone that undergoes it, the question arises whether YUCATEC MAYA DOWNSTEP (14) should be reformulated so as to allow an optional L-tone to appear between it and the target. The answer is no, as there is no indication that the inserted L does not undergo downstep.

7. Summary

Yucatec Maya has three long syllables, Long High, Long Low and Glottalized, which are stressed, and a word-initial Short syllable which is stressed. Stressed syllables serve as tone bearers. The lexical representation of Long High includes a H-tone, and that of Glottalized has a H-ti=one pre-linked to the first mora. In effect, the mora is the tone-bearing unit in Glottalized syllables, while for the other syllable types the syllable is the TBU. Short and Glottalized Low acquire a L-tone. Unstressed syllables (non-initial short syllables in the word, function words) do not attract default tones, and tones do not associate with them. However, a L-insertion rule puts a L-tone between H-tones, provided at least one toneless syllable or mora intervenes. The string of tones is realized straightforwardly, except for a lowering effect that H-tones have on subsequent tones. We have established this regularity for all four speakers, although it was more pronounced in one speaker, speaker W. Unlike the other three speakers, this speaker also produced a weak final rise in phrase-final low tones, and in the case of final Long High syllables is set A produced a later peak timing if

the word in question had Corrective focus. In not other case did we find any difference between pronunciations of Given words and pronunciations of the same words with Corrective focus.

References

- Archibald, John (1996). The acquisition of Yucatec Maya prosody. UC Berkeley International Conference of Phonological Acquisition, Berkeley, CA. UC Berkeley Linguistics Department. 99-112.
- Blair, Robert W. and Vermont-Salas, Refugio (1965) *Spoken Yucatec Maya. Book 1: Lessons 1-12*. Chapel Hill, NC: Duke University/University of North Carolina, Program in Latin American Studies.
- Bricker, Victoria, B. and Poʔot Yah, Eleuteria and Dzul de Poʔot, Ofelia (1998) *A dictionary of the Maya language as spoken in Hocabá.Yucatán*. Salt Lake City: The University of Utah Press.
- Fisher, William M. (1976) On tonal features in the Yucatan dialects. *Mayan Linguistics* 1, 29-43.
- Gussenhoven, C. (2004). *The Phonology of Tone and Intonation*. Cambridge UK: Cambridge University Press.
- Gussenhoven, C. (2006). Yucatec Maya tones in sentence perspective. Poster presented at LabPhon10. Paris, 29 juni-1 juli 2006. http://www.let.ru.nl/gep/carlos/yucatec_maya_poster.pdf
- Kügler, F. & S. Skopeteas (2006). Interaction of lexical tone and information structure in Yucatec Maya. *TAL* 2006. 380-388.
- Ladd, D.R. (1984). Declination: A review and some hypotheses. *Phonology Yearbook* 1, 53-74.
- Lieberman, M. & Pierrehumbert, J. B. (1984). Intonational invariance under changes in pitch range and length. In M. Aronoff and R.T. Oehrle (eds) *Language and Sound Structure*. Cambridge MA and London UK: MIT Press.
- Pike, K.L. (1946). Phonemic pitch in Maya, *IJAL* 12, 82-88.

Appendix A

Instrucciones Para el Trabajo: Leelo en Maya

Con permiso pedimos que Usted lea 192 frases cortitas en Maya, por ejemplo ya'ax kaan 'culebra verde', o kin wilik me'ex 'veo una barba'.

Cada frase va a aparecer en la pantalla de la computadora, junta con un número y un dibujo, lo cual indica lo que quiere saber unas de las palabras en la frase.

Cuando está leyendo Usted, vamos a grabarle su voz. Esta grabación forma parte de una investigación de la pronunciación en Maya. La investigación solo tiene un interés científico, y los departamentos de lingüística de Nijmegen (Países Bajos) y la Universidad de California at Berkeley la está dirigiendo.

Eso es como va:

1. La frase aparece en la pantalla. Mira la frase y el dibujo, y asegúrese que entiende bien lo que quiere decir la frase.
2. Por favor que lea claramente: (a) el número que está en la pantalla (b) la frase (dos veces). Si se siente que en algunos de los dos momentos, que no lo leyó bien, léalo otra vez, hasta que se sienta que lo ha leído lo más correcto.
3. Apunta la marca flechada para la pantalla siguiente.

Si Usted tenga tiempo, está bien que lea las frases antes de la grabación, las puede ver en los "printouts" de las pantallas. Se va a ver que algunas de las frases tienen sentidos raros. Hemos marcado por mano en el "print out" esos sentidos raros, pero esas palabras escritas no van a parecer en las pantallas.

Por participar en el proyecto, hay una paga para Usted. Si quiere un reportaje de los resultados de la investigación, por favor deje su nombre y su dirección para que le enviemos a Usted. Muchas Gracias, Diyos Bo'otik!

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