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# THE PERCEPTION OF ABSOLUTE INTERROGATIVES IN K'ICHEE'

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Although K'ichee' employs an absolute interrogative-marking particle, previous studies have claimed that it also marks absolute interrogatives prosodically via a rising boundary tone. This paper presents a categorical perception task of K'ichee' in which the boundary tone was manipulated in utterances with and without the absolute interrogative-marking particle and with utterances that contained a wh- word question.

Results indicate that although utterances with wh- word questions were perceived as interrogatives regardless of the boundary tone manipulation, the intonation was a factor in the perception of absolute interrogatives. The participants in this study perceived utterances with rising boundary tones as questions and utterances with flat or falling boundary tones as statements, regardless of the presence of the absolute interrogative-marking particle. Thus, the absolute interrogative-marking particle in K'ichee' appears to be losing its meaning as speakers are relying solely on intonation. Although intense contact with Spanish could be a variable in the loss of meaning of the question-marking particle, it is proposed that this is could also be a natural diachronic process.

**Keywords:** absolute interrogatives, boundary tones, categorical perception, K'ichee'

## 1 Introduction

It is common in many spoken languages for absolute interrogatives (i.e., polar, yes/no questions) to be differentiated from syntactically identical declaratives via prosodic means: a rising boundary tone (H%) at the end of a question or a falling boundary tone (L%) at the end a statement, though there are some exceptions (Gussenhoven 2004). Conversely, when an interrogative is marked in some morphosyntactic way, it is generally not necessary to mark the interrogative with a rising boundary tone as well. Such is the case with wh- word questions in various languages and even with absolute interrogatives in others.

For example, in Russian, the particle *li* is used to mark an absolute interrogative and no rising boundary tone is needed to express it as such, as in (1). However, when the particle *li* is not present, the example in (2) can be understood as an interrogative if it ends with a rising boundary tone (Meyer & Mleinek 2006:1616).

- |     |                           |        |             |             |
|-----|---------------------------|--------|-------------|-------------|
| (1) | Kupila                    | li     | Maša        | knigu? (L%) |
|     | bought                    | Q      | Masha.NOM   | book.ACC    |
|     | 'Did Masha buy the book?' |        |             |             |
| (2) | Maša                      | kupila | knigu? (H%) |             |
|     | Masha.NOM                 | bought | book.ACC    |             |
|     | 'Did Masha buy the book?' |        |             |             |

In Central and Majorcan Catalan, absolute interrogatives can be optionally headed by the unstressed particle *que*, making both (3) and (4) possible. However, Prieto & Rigau (2007:29-30) state that without *que*, (3) needs to end with a rising boundary tone in order to be perceived as an interrogative, whereas (4), with *que*, does not.

- (3) Plou? (H%)  
rains  
'Is it raining?'
- (4) Que plou? (L%)  
Q rains  
'Is it raining?'

1.1 Absolute interrogatives in K'ichee'

The present study analyzes the interaction of boundary tones and the morphosyntactic absolute interrogative-marker in the perception of K'ichee' interrogatives. Similar to Russian and Catalan, K'ichee' employs the particle *la*, which is placed at the beginning of an utterance, in order to change a declarative to an absolute interrogative (López Ixcoy 1997; Mondloch 1978) as in (5) and (6); *la* is reduced to *a* in the Cantel dialect of K'ichee', the dialect under analysis in this paper (Nielsen 2005).

- (5) Nim le ala.  
big DET boy  
'The boy is big.'
- (6) (L)a nim le ala?  
Q big DET boy  
'Is the boy big?'

Nonetheless, Nielsen (2005) states that interrogatives that are headed with *a* also end with a rising boundary tone in Cantel K'ichee'. Thus, in contrast to Russian and Catalan, Nielsen claims that both the morphosyntactic marker and a rising boundary tone are used to mark absolute interrogatives in K'ichee'. Figure 1 presents the spectrogram and intonational contour of (5) and Figure 2 presents those of (6), as produced by a female native speaker of Cantel K'ichee'. These spectrograms are labeled following the ToBI system proposed for Cantel K'ichee' in Nielsen (2005).

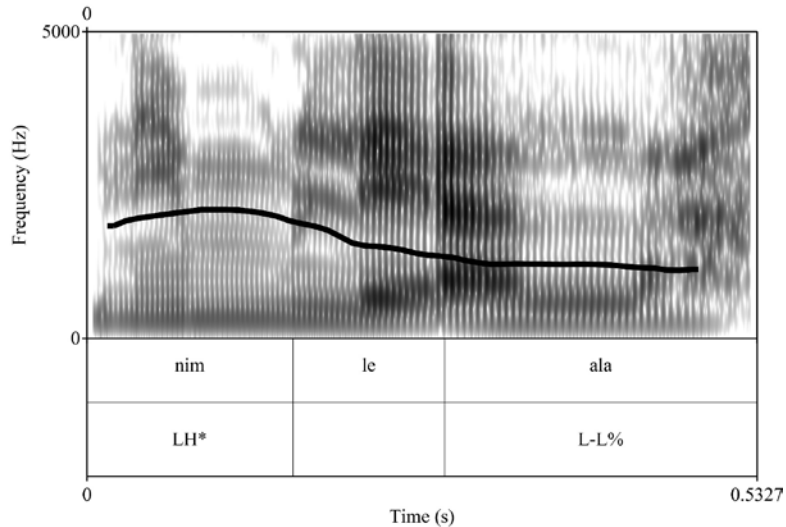


Figure 1: Spectrogram and intonational contour of the phrase *nim le ala* 'the boy is big'.

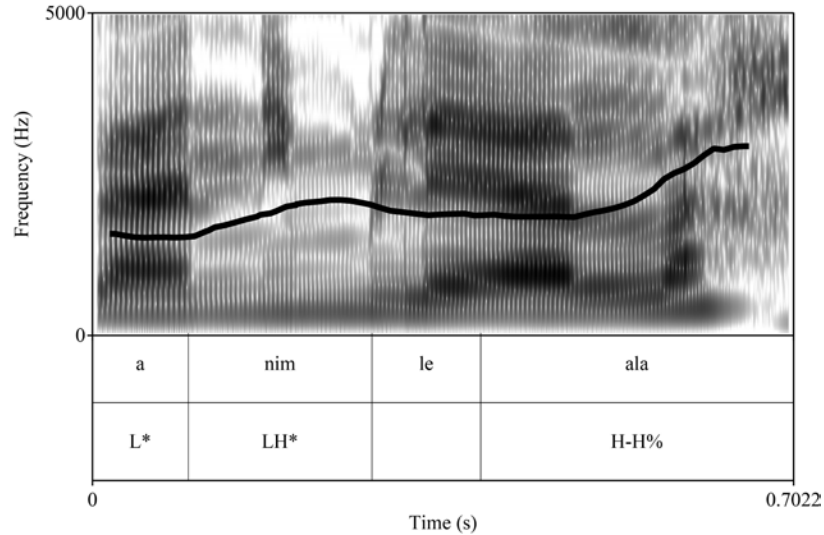


Figure 2: Spectrogram and intonational contour of the phrase *a nim le ala* ‘is the boy is big?’.

The goal of the present study is to investigate the following research questions: (i) are both the question-marking particle *a* and a rising boundary tone needed in order for an utterance to be perceived as an absolute interrogative in K'ichee'?; (ii) Will an utterance be perceived as an interrogative with *a* present but without a rising boundary tone and will an utterance be perceived as an interrogative without *a* but with a rising boundary tone?; (iii) Does the boundary tone play any role in the perception of other types of interrogatives in K'ichee', i.e., wh- word questions?

## 2 Methodology

In order to answer the research questions, a categorical perception study was designed. This method, modeled after Liberman, et al. (1957), has been extended to the perception (identification) of the various meanings associated with different intonational contours of syntactically identical phrases in languages such as, but not limited to, English and Swedish (Hadding-Koch & Studdert-Kennedy 1964), Russian and Japanese (Makarova 2001), European Portuguese (Falé & Faria 2006), Majorcan Catalan (Vanrell Bosch 2006), French (Vion & Colas 2006) and Italian (Savino & Grice 2007).

### 2.1 Stimuli

The same female native speaker of Cantel K'ichee' that produced the examples in Figures 1 and 2 was recruited to produce the stimuli for this study. The speaker was recorded via a Shure SM10A dynamic head-mounted microphone with a Marantz PMD661 solid-state digital recorder digitized at 16 bits (44.1 kHz) in a quiet room in Cantel, Guatemala. The stimuli included the phrase *nim le ala* ‘the boy is big’ with and without the question-marking particle *a* at the beginning and the phrase *jachin le ala* ‘who is the boy?’ as the wh- word stimulus.

The stimuli were manipulated in Praat (Boersma & Weenink, 1999-2016). As stress is fixed in word-final position in K'ichee' and the boundary tone is associated with the last stressed syllable of an utterance (Baird 2014; López Ixcoy 1997), the boundary tone manipulation was performed at the beginning of /l/ and throughout the end of the word in /ala/ for each utterance. An analysis of the utterances produced by the speaker revealed no differences in F<sub>0</sub> height at the beginning of the stressed syllable, [F<sub>(2, 7)</sub> = 1.19, *p* = .761], therefore, a continuum was created using the utterances shown in

Figures 1 and 2 as reference points. In Figure 1, the intonational contour remains relatively level from the beginning of /l/ to the end of the phrase and in Figure 2 the contour begins to rise at /l/ and continues to rise to the end of the phrase, reaching a height 12 semitones (st) higher than the end of the contour in Figure 1. Consequently, the continuum was designed to have a 6 st difference between each step.

The steps of the continuum were analyzed in a pilot study in which 6 native speakers of Cantel K'ichee' listened to each step and judged it according to how natural it sounded. From this, a six-step continuum was created for each utterance and a schematic of this continuum is presented in Figure 3.<sup>1</sup>

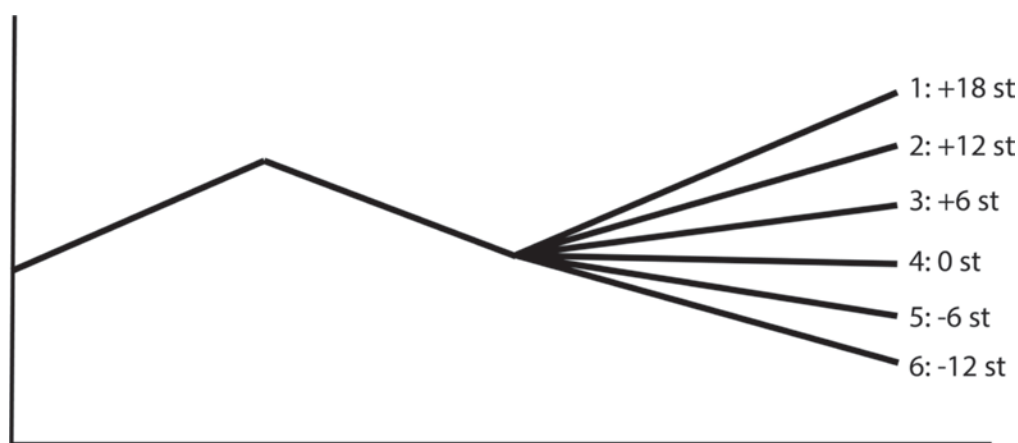


Figure 3: Schematic of the six-step categorical perception continuum of the boundary tone.

## 2.2 Procedure and analysis

17 native speakers of Cantel K'ichee' participated in this study (9 female, 8 male, ages 22-38): all were bilingual in Spanish.<sup>2</sup> The participants reported to have lived in Cantel their entire lives and none reported any auditory problems. The stimuli were randomized and, along with distractor stimuli, burned onto 5 different CDs in order to be presented to the participants via a Memorex MD6451BLK CD player with headphones. Each participant was given an answer sheet and asked the question "Is this a question?" They were instructed to circle either 'yes' or 'no' for each stimulus they heard and could only listen to each one once.<sup>3</sup> In sum, each participant heard each step 4 times, resulting in a total of 1,224 identifications (3 utterances x 6 steps x 4 repetitions x 17 participants).

The results were analyzed via mixed design ANOVAs. For each utterance, with *a* at the beginning of the utterance, without *a*, and with a wh- word question, the step (1-6 on Figure 3) was the between-subjects factor, the answer (identification of a stimulus as either a question or a statement) was the within-subjects factor, and speaker and token were random terms. The differences between individual steps were further analyzed via Bonferroni Post Hoc tests. Differences in identification between the 'with *a*' and the 'without *a*' utterances were also analyzed at each individual step on the continuum in order to determine if the presence, or lack thereof, of the question-marking particle *a* had any influence on the perception at a specific step of the continuum. The CD used for each participant was also included in these analyses, but it never revealed a significant effect and is not reported here.

<sup>1</sup> A seventh step was created in which the boundary tone ended at 18 st below step 4. However, this step was judged to be unnatural, likely because of how low it ended.

<sup>2</sup> All participants were assessed as Spanish-dominant via the Bilingual Language Profile (Birdsong et al. 2012). Language dominance was included in the statistical analysis but was never significant and is not reported here.

<sup>3</sup> Due to very low literacy rates in K'ichee' (Baird 2018), the answer sheet was written in Spanish. Nonetheless, the only words present on the answer sheet were *¿Es pregunta?*, *sí*, and *no*.

### 3 Results

The results of the task demonstrate that every token of the wh- word question *jachin le ala* 'who is the boy?' stimuli was perceived as a question, regardless of the manipulation of the boundary tone. Thus, the results of these stimuli were not analyzed statistically. The results of the utterances with and without *a* are presented in Figure 4, where a significant crossover in perception is noted between steps 3 and 4 for both utterances.

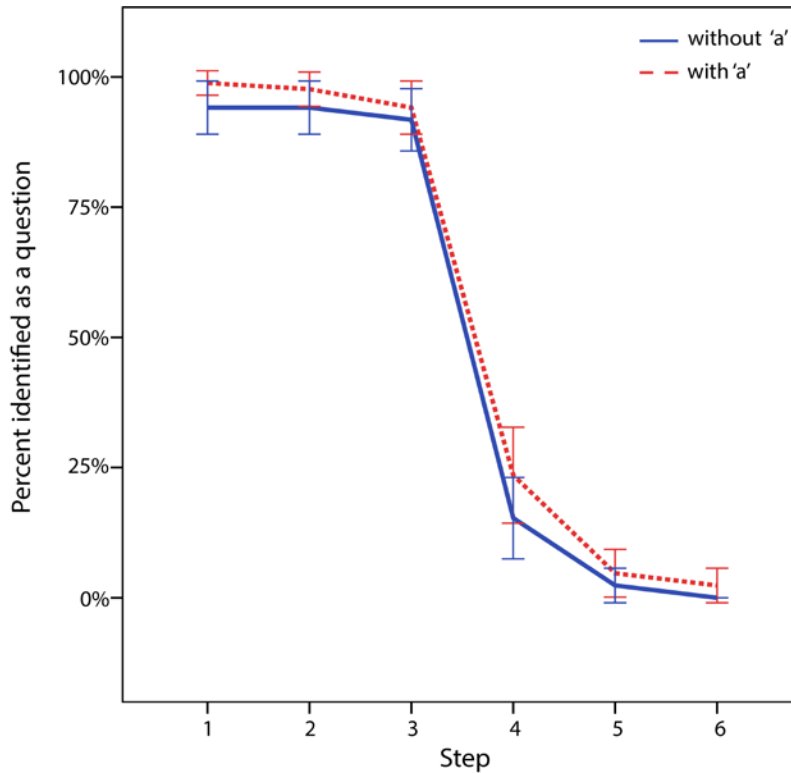


Figure 4: Results of the perception task for absolute interrogatives.

The results of the ANOVA for the stimuli without the question-marking *a* reveal a significant main effect,  $[F(5, 19.738) = 345.423, p < .001]$ . The results of the Bonferroni Post Hoc tests, shown in Table 1, demonstrate that there were no significant differences between the perception of the stimuli in steps 1-3, nor between the perception of steps 5 and 6. In other words, steps 1-3, all which ended in a rising boundary tone to various degrees, were all perceived as questions whereas steps 5 and 6, which ended in a falling boundary tone, were perceived as statements. Step 4, which ended in a flat boundary tone, was also primarily perceived as a statement, though significantly less so than steps 5 and 6. These results indicate that an utterance in Cantel K'ichee' need not have the question-marking particle *a* at the beginning in order to be perceived as an absolute interrogative, as long as the utterance ends in a rising boundary tone.

Step	1	2	3	4	5
2	1.000				
3	0.988	0.942			
4	<.001	<.001	<.001		
5	<.001	<.001	<.001	0.006	
6	<.001	<.001	<.001	0.001	0.964

Table 1: *p* values for Bonferroni Post Hoc comparisons of stimuli without *a*

The analysis of the stimuli with the question-marking particle *a* demonstrate parallel findings to the previous analysis of the of the stimuli without *a*. The ANOVA demonstrated a significant main effect, [ $F_{(5, 19.632)} = 344.682, p < .001$ ], and the Post Hoc tests reveal no significant differences between steps 1-3 nor between steps 5 and 6 (see Table 2). Again, step 4 was generally perceived as a statement, but less so than steps 5 and 6. The results for steps 4-6 are of particular note, as they indicate that these participants are perceiving the stimuli that do not end in a rising boundary tone as statements, even those these utterances begin with the absolute interrogative-marking particle *a*.

Step	1	2	3	4	5
2	1.000				
3	0.793	0.929			
4	<.001	<.001	<.001		
5	<.001	<.001	<.001	<.001	
6	<.001	<.001	<.001	<.001	0.926

Table 2: *p* values for Bonferroni Post Hoc comparisons of stimuli with *a*

Finally, the results for the ANOVA comparisons of steps across the two types of absolute interrogative utterances are presented in Table 3. These results reveal that there were no significant differences in how each step was perceived, regardless of the presence of *a*, although the comparison of step 4 across utterance types did approach significance. Thus, the stimuli in this study were perceived as questions or statements according to the boundary tone, and the absolute interrogative-marking particle *a* had no effect.

Step comparison	ANOVA results
1	$F_{(1, .288)} = 1.841, p = .177$
2	$F_{(1, .053)} = 1.336, p = .249$
3	$F_{(1, .024)} = 0.355, p = .552$
4	$F_{(1, .094)} = 2.777, p = .097$
5	$F_{(1, .024)} = 0.686, p = .409$
6	$F_{(1, .024)} = 2.024, p = .157$

Table 3: ANOVA results for the step comparisons across stimuli with and without *a*.

## 4 Discussion

The objective of this study was to examine the roles of prosody and morphosyntax in the perception of interrogatives in the K'ichee' spoken in Cantel. Specifically, the research questions posed in Section 1 asked whether or not both a rising boundary tone and the absolute interrogative-marking particle *a* in K'ichee' are necessary in order for an utterance to be understood as a question. Furthermore, it also asked if a rising boundary tone was necessary for an utterance with a *wh-* word to be perceived as a question. In order to answer these questions, a categorical perception task with a six-step continuum of rising and falling boundary tones was designed.

The results of this task demonstrate that the boundary tone played no role in the perception of the stimuli with a *wh-* word question. These results are not surprising, and they mirror the prosody-morphosyntax interaction for *wh-* word questions cross-linguistically (Gussenhoven 2004). Simply put, if an interrogative is marked in some morphosyntactic manner there is generally no need to mark it prosodically as well. The results of the stimuli without the absolute interrogative-marking particle *a* also follow this notion. As there is no morphosyntactic marker in the utterance, a rising boundary tone is needed in order for it to be perceived as an interrogative. Additionally, the finding that steps 1-3 for the stimuli with the question-marking particle *a* were generally perceived as questions demonstrates that having both the morphosyntactic marker and a rising boundary tone present does not hinder the stimuli's perception as interrogatives. However, the results for steps 4-6 for the stimuli with the particle *a* at the beginning of the utterance demonstrate contrasting findings in that the morphosyntactic marker was largely ignored by the participants in this study. Given that these syntactically marked utterances that do not end in a rising boundary tone were perceived as statements, the data suggest that the absolute interrogative-marking particle *a* may be losing its meaning in Cantel K'ichee'. The results of step 4 with the flat boundary tone indicate that it may still have some effect, as the stimuli with *a* were perceived as a question more than the stimuli without *a* at a rate that approached significance.<sup>4</sup>

The question then turns to why *a* is being lost in this variety of K'ichee'. It has been proposed by some scholars that such changes in Mayan languages are due to contact with Spanish: see England (2003) for a discussion. Indeed, several studies have demonstrated the influence of Spanish on Mayan languages both in terms of morphosyntax and prosody (Baird 2017, 2018; Montgomery-Anderson 2010). Colantoni (2011) argues that in contact situations and among bilinguals, speakers may associate existing intonational patterns in each language with new pragmatic meanings or they may converge or transfer features between the languages. As Spanish absolute interrogatives can be marked solely through a rising boundary tone (Hualde 2005), it is conceivable that the particle *a* is being lost as K'ichee' absolute interrogatives become similar to absolute interrogatives in Spanish, the national and majority language of Guatemala.

Nonetheless, a rising boundary tone on absolute interrogatives is so common cross-linguistically that several have proposed it to be a 'natural' or 'universal' feature of human languages associated with the frequency code (Bolinger 1972; Cruttenden 1997; Gussenhoven 2004).<sup>5</sup> As nothing is known about K'ichee' intonation before it came into contact with Spanish in the 16<sup>th</sup> century, it is plausible that K'ichee' has always marked absolute interrogatives with a rising boundary tone. Furthermore, various languages demonstrate diachronic changes in which prosody alone is now used for semantic and or pragmatic meanings where specific morphosyntactic structures were once generally employed (Baird 2018; Camacho 2006). Thus, it is difficult, if not impossible, to demonstrate that the loss of meaning of the absolute interrogative-marking particle *a* in Cantel K'ichee' is due to contact with Spanish alone as this development could very well be a natural diachronic process cross-linguistically. However, it should be noted that such a process could be accelerated by language contact (Bullock & Toribio 2004).

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<sup>4</sup> The flat boundary tone in step 4 would be classified as L-L% in the ToBI system of Cantel K'ichee' proposed by Nielsen (2005).

<sup>5</sup> A few languages that been reported to have rising intonation on statements and falling intonation on questions, such as Chickasaw (Gussenhoven, 2004).



## 5 Conclusions

Although one must consider other factors in the perception of interrogatives, such as pragmatic context, the results of the perception task presented in this study show that these participants are using intonation as a key factor in their identification of absolute interrogatives and are disregarding the morphosyntactic marker. Thus, it is suggested that the absolute interrogative-marking particle *a* is in the process of losing its meaning in the K'ichee' of Cantel, though the same cannot be said of the *wh*- word question *jachin* 'who'. As K'ichee' presents profuse dialectal variation (Par Sapón & Can Pixabaj 2000), this may not be the case in other varieties, which tend to not reduce the marker *la* to *a*.

Although intense contact with Spanish could be a principle factor in the loss of meaning of *a*, it is difficult to determine if such is the case. It has been proposed that K'ichee' may have always marked absolute interrogatives with a rising boundary tone and that the changes in the perception of the absolute interrogative marker *a* may be a normal diachronic process cross-linguistically, even if contact with Spanish has been a factor in said process.

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