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Remijsen, A.C.L.; Heuven, V.J. van

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*Stress, tone and discourse prominence in the Curaçao dialect of Papiamentu**

Bert Remijsen

Vincent J. van Heuven

LUCL, University of Leiden

This paper investigates the word-prosodic system of the Curaçao dialect of Papiamentu. Curaçao Papiamentu has both lexically distinctive stress and, independently, a word-level tone contrast. On the basis of a detailed acoustic investigation of this tonal contrast, we propose a privative phonological interpretation of the tone contrast, similar to proposals for the Scandinavian word-accent systems (Riad 1998, to appear). As compared to previous treatments of Curaçao Papiamentu word prosody, our hypothesis makes crucial reference to intonation and to tonal underspecification. We also investigate the realisation of primary and secondary stress in Curaçao Papiamentu.

1 Introduction

Several studies have reported that Papiamentu has both lexically distinctive tone and, independently, lexically distinctive stress (e.g. Devonish 1989, Römer 1991, Kouwenberg & Murray 1994, Rivera-Castillo 1998). Most studies analyse the tone system as involving lexical specification for tone on every syllable. However, some authors have noted that high pitch

* The recordings were made in Willemstad, Curaçao, in the offices of the *Fundashon pa Planifikashon di Idioma* (FPI), an institute whose functions include the production of language-learning resources for Papiamentu and the translation of books for all ages. Farienne Martis of the FPI supervised the recording sessions. We are very grateful to her. The first author also gratefully acknowledges the hospitality of the FPI, and of its director, Ronnie Severing, which he and his wife enjoyed for three months.

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is mostly restricted to one syllable per word (Rivera-Castillo 1998, Kouwenberg 2004). It appears worthwhile, therefore, to consider alternative accounts involving underspecification of tone at the word level. In addition, little is known about the realisation of the hypothesised stress and tone contrasts, and about how they interact with phrase-level (intonational) features in Papiamentu prosody – none of the hypotheses formulated in previous studies has been quantitatively tested. As demonstrated by studies such as Bruce (1977) and Pierrehumbert & Beckman (1988), both consideration of the interaction with phrase-level prosody and quantitative analysis are important components of a comprehensive analysis of word-level prosodic contrasts.

This paper presents a new phonological analysis of the word-level prosodic system of the Curaçao dialect of Papiamentu. We carried out an acoustic investigation of the word-prosodic patterns of Curaçao Papiamentu in a number of utterance contexts. Our study confirms that Papiamentu has both lexically contrastive stress and a lexical tone contrast. With respect to the nature of the tone contrast, we found that it can be analysed best in terms of a privative word-level tone contrast. That is, our phonetic investigation supports a phonological analysis in which one member of the tone contrast involves a lexical tone, irrespective of the intonational context. The other member is characterised by the absence of this tone. In this respect, our analysis is similar to accounts of ‘word accent’ in e.g. Stockholm Swedish (Riad 1998) and Venlo Dutch (Gussenhoven & van der Vliet 1999).

The structure of the paper is as follows. §1 introduces the word-level prosodic phonology of Papiamentu. This section includes a description of the facts, a brief overview of previous work, and our own alternative analysis of the tone contrast. §2 reports on an acoustic investigation of the word-prosodic contrasts in the Curaçao dialect of Papiamentu. The results corroborate our alternative analysis of the tone system. §3 presents the main conclusions and future directions. In addition, we compare the Curaçao Papiamentu tone contrast with that of Stockholm Swedish, and consider some similar prosodic systems.

2 The phonology of Curaçao Papiamentu word prosody

Papiamentu has both distinctive stress and lexically contrastive tone. In §2.2, we consider each of these phenomena in turn, before focusing on minimal contrasts. We then briefly summarise previous work on Papiamentu prosody (§2.3). Our own proposals for the phonological representation of tone in the Curaçao dialect of Papiamentu are outlined in §2.4.

2.1 Papiamentu

Papiamentu is a Caribbean Creole, with around 200,000 speakers (Kook & Narain 1993: 71). It is the first language of most of the population of the

islands Aruba, Curaçao and Bonaire, which are located just north of Venezuela. In addition, there is a sizeable Papiamentu community in the Netherlands. The main lexifier languages are Portuguese and Spanish. Dutch and English have also influenced the lexicon, but to a lesser extent.

The literature and native speaker judgements agree that the dialects of Papiamentu on Aruba, Curaçao and Bonaire are different, and that speech melody is one of the dimensions in which the dialects diverge most (Kook & Narain 1993: 72, Enrique Muller, personal communication, Ini Statia, personal communication). The analyses presented in this paper are all based on data from the Curaçao dialect of Papiamentu, and it is unlikely that our sample would faithfully reflect the prosodic characteristics of the dialects of Aruba and Bonaire.

2.2 Descriptive facts

2.2.1 *Stress*. In this section, we will lay out the main facts in relation to the word-level stress pattern of Curaçao Papiamentu, on the basis of the data in Kouwenberg & Murray (1994) and Kouwenberg (2004). In verbs, the location of primary stress is predictable from the number of syllables and the morphological category. The vast majority of disyllabic verbs have penultimate stress in the base form. This pattern is illustrated in (1a).¹ In the corresponding participle forms (1b), however, stress is on the final syllable. That is, the derivation of the participle is marked by a shift of stress to the final syllable.

- | | | | |
|--------|--------------------------------|----|-------------------------------|
| (1) a. | _{II} 'mata 'to kill' | b. | _{II} ma'ta 'killed' |
| | _{II} 'subi 'to climb' | | _{II} su'bi 'climbed' |
| | _{II} 'sinti 'to feel' | | _{II} sin'ti 'felt' |

Longer verbs uniformly have final stress, both in the base form and in the participle – e.g. _{II} *apare'se* 'to appear' – 'appeared' and _I *kumin'sa* 'to begin' – 'begun'. Verbs generally end in an open syllable, although there are some exceptions, which tend to have a Dutch or English origin – e.g. _I *'feter* 'to lace' and _I *'wak* 'to watch'. Verbs of Dutch or English origin also stand out in that the participle is marked by means of a prefix rather than by stress shift – e.g. _I *'feter* becomes *he-*_I *'feter* 'laced (up)'. In general, participle formation is the only way in which verbs may be inflected.

In nouns, adjectives and adverbs – i.e. in all lexical categories other than verbs – stress is to some extent predictable from syllable weight, with closed syllables counting as heavy. That is, stress is on the penultimate,

¹ Curaçao and Bonaire use a phonemically oriented orthography (cf. Kouwenberg & Murray 1994). In this paper, we follow its conventions for segments, but not with respect to prosody, as it does not represent prosodic contrasts consistently. Primary and secondary stress are transcribed using the IPA symbols ' and , respectively. Tone patterns I and II (see §2.2.2) are indicated as _I and _{II}. Grave accents, as in _I *bèk* and _I *skòp*, mark vowel quality, not prosody.

unless the final syllable is heavy, in which case the final syllable is stressed, as shown in (2).

- (2) a. ₁'Ruba 'Aruba' b. ₁me'ner 'mister'
 ₁'klechi 'sheet' ₁pa'pel 'paper'
 ₁shi'nishi 'grey' ₁fa'lis 'suitcase'
 ₁'sushi 'dirty' ₁si'gur 'certain'

However, there are many exceptions to this weight-sensitive stress rule – see the examples in (3). In these examples, stress tends to follow the stress pattern of the word in the relevant lexifier language, resulting in irregular final, penultimate and antepenultimate stress patterns. Devonish (1989: 56) attributes stress patterns squarely to the lexifier language, presumably motivated by the number of such exceptions.

- (3) a. ₁'hoben 'young' b. ₁li'he 'light' c. ₁'agui₁la 'eagle'
 ₁'kamber 'room' ₁chi'ki 'small' ₁de'posi₁to 'storage'

Secondary stress is associated with alternating syllables preceding or following the main stress – e.g. ₁'agui₁la 'eagle', ₁₁ombe'skop 'rude' and ₁₁kumin'sa 'to begin'. Secondary stress, then, is predictable, given the position of primary stress.

While some affixes and clitics affect stress assignment, others do not. We already mentioned the participle-marking prefix *he-*, which does not affect the position of stress in the root. The same goes for, among others, the suffix *-nan*, which marks plural on nouns. On the other hand, the suffix *-do*, which derives agentive nouns from verbs, attracts stress, overriding the stress pattern of the verb. For example, ₁₁'gana 'to win' becomes ₁₁gana-'do 'winner', with final stress. Stress assignment is also sensitive to the pronominal clitics *-mi*, *-bu* and *-e*, the object pronouns for 1st, 2nd and 3rd singular respectively. For example, ₁₁'buska 'to search' becomes ₁₁bus'ka-mi, ₁₁bus'ka-bu and ₁₁bus'k-e.

Complex noun formation does not involve a merger of the constituent nouns into a single prosodic word. Whereas certain concepts have been borrowed from compounds in the lexifier language – e.g. ₁'bi(f)stek ~ ₁bi(f)'stek 'steak' – the productive process involves the conjunction *di*, as in ₁de'posi₁to di ₁pa'pel 'supply of paper'.

2.2.2 Tone. In addition to word-level stress, Curaçao Papiamentu has a word-level tone distinction. This contrast is illustrated by the fundamental frequency (F0) tracks in Fig. 1. The majority of words have rising pitch on the stressed syllable in the citation form and when focused in an affirmative declarative sentence (see Fig. 1a). Most disyllabic verbs, however, have falling pitch on the penultimate syllable and rising pitch on the final syllable in the same contexts. This pattern is illustrated in (b) and (c), where the fall is quite gradual. Hereafter we will refer to these tone patterns as TONE I and TONE II, respectively. In Fig. 1, both the rise

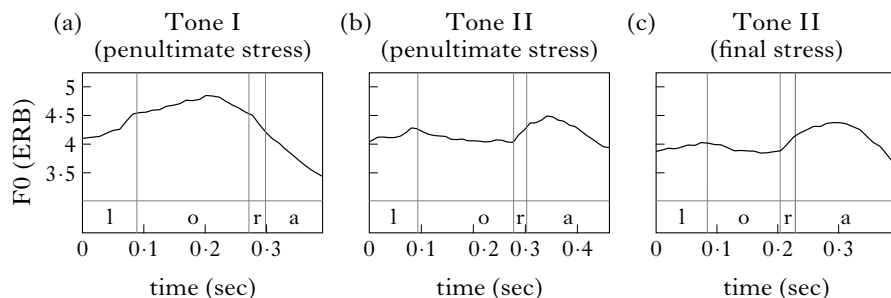


Figure 1

F0 tracks of a disyllabic minimal set for stress and tone: ${}_1'lora$ 'parrot' (a) vs. ${}_2'lora$ 'to turn' (b) vs. ${}_2'lo'ra$ 'turned' (c). Tracks (a), (b) and (c) are averaged over 18, 17 and 16 tokens respectively. Data from nine speakers, elicited in citation form. The dataset is introduced in §3.1.1, and the averaging of F0 tracks is discussed in §3.1.2.

of tone I (a) and the rise of tone II (b, c) are immediately followed by a fall. This is due to a low boundary tone, which marks the end of the utterance.

The terms tone I and tone II are new to this paper. Importantly, they are used merely to describe and transcribe the tone patterns, not as terms of phonological analysis. The latter will be provided below, in §2.4.

There is a small number of exceptions to the generalisations that disyllabic verbs have tone II, and that all other words have tone I. First, there is a handful of non-verbs that have tone II – e.g. ${}_2'mucha$ 'child', ${}_2'piska$ 'fish' and ${}_2'tambe$ 'also'. Conversely, a small number of disyllabic verbs have tone I. Examples include ${}_1'fangu$ 'to catch' and ${}_1'feter$ 'to lace'. These words are all of Dutch or English origin.

In tone patterns I and II, rising pitch is limited to a single syllable: the stressed syllable in tone I words, and the final syllable in disyllabic verbs with tone II. It has been argued, however, that certain words have rising or high pitch on more than one syllable. Two different patterns are mentioned in this context in the literature. First, there are 'inherited compounds' (Kouwenberg & Murray 1994), in which each of the member elements is reported to retain high pitch on its own stressed syllable – e.g. ${}_1'stofzuiger \sim {}_1'stof'zuiger$ 'vacuum cleaner' (from Dutch *stof* 'dust' and *'zuiger* 'sucker') and ${}_1'bi(f)stek \sim {}_1'bi(f)'stek$ 'steak'. As seen from our transcriptions, our data suggest that these words have tone I – i.e. rising pitch on the stressed syllable only – but that speakers vary in the location of stress.

Second, there are nouns with three or more syllables such as ${}_1'agui'la$ and ${}_1'de'posi'to$. Rivera-Castillo (1998) and Kouwenberg (2004) transcribe such words with a high tone on the final syllable, in addition to the high tone on the stressed syllable. However, sources are not unanimous. Notably, Römer (1991), a native speaker of Curaçao Papiamentu, does not consistently transcribe this additional high tone. We will investigate this issue in §3.3.2.

In affixation processes involving tone II word stems, it is unclear whether the tone pattern changes along with a shift in primary stress. For example, we have tentatively transcribed tone I in _I'gana-'do 'winner', which is derived from _{II}'gana 'to win'. This transcription is impressionistic. It could be that the transcription _{II}'gana-'do is actually more appropriate.

2.2.3 Minimal lexical contrasts for stress and tone. Both stress and tone are to some extent unpredictable and therefore distinctive in Curaçao Papiamentu. Stress is distinctive in most disyllabic verbs, where it distinguishes the base form from the participle. Tone distinguishes disyllabic verbs (tone II) from disyllabic non-verbs (tone I). Joubert (1991) lists 251 word pairs distinguished solely by tone. The three different combinations of stress and tone in disyllabic words are illustrated by the minimal sets in (4).

(4) *Examples of minimal contrasts of stress and tone in disyllabic words*

a. *Tone I (penultimate stress)*

- _I'lora 'parrot'
- _I'baba 'dribble (N)'
- _I'sala 'living room'

b. *Tone II (penultimate stress)*

- _{II}'lora 'to turn'
- _{II}'baba 'to dribble'
- _{II}'sala 'to salt'

c. *Tone II (final stress)*

- _{II}lo'ra 'turned'
- _{II}ba'ba 'dribbled (on)'
- _{II}sa'la 'salted'

As seen in Figs 1b and c, the realisation of tone II is not affected by the location of stress. Whether a verb appears in the penult-stressed base form or in the final-stressed participle form, tone pattern II is consistently realised, both in citation form and in focus in a declarative utterance. In the same contexts, however, tone I words invariably have rising pitch on the stressed syllable – whatever its position in the word.

2.3 Previous analyses

The prosodic phonology of Papiamentu has attracted considerable interest (Devonish 1989, Römer 1991, Kouwenberg & Murray 1994, Devonish & Murray 1995, Rivera-Castillo 1998, Kouwenberg 2004, Rivera-Castillo & Pickering 2004). All of these studies assume the presence of lexical tone, and, with the exception of Devonish (1989), they all postulate an independent word-level stress prosodeme. The most comprehensive study on Papiamentu prosody is Römer (1991), the only study to consider

phrasal and utterance-level prosody in addition to word-prosodic contrasts.

In most previous analyses of Papiamentu word prosody, every syllable of a word is analysed as specified for tone (Low or High). For example, the first minimal pair for tone in (4) would be transcribed – using IPA conventions rather than our own transcription – as *'lòrà* ‘parrot’ *vs.* *'lòrá* ‘to turn’, in terms of the analyses of Römer (1991), Rivera-Castillo (1998) and Kouwenberg (2004). Interestingly, Kouwenberg notes that this full tonal specification of syllables supports a more complex set of tone contrasts than is actually found in the data: there are no content words that are transcribed with Low tones only, and most words are transcribed as having exactly one High tone. There are also words that have been transcribed with two High tones: inherited compounds, and words with antepenultimate stress. As noted in §2.2.2, we question the accuracy of these transcriptions.

The analysis of tone II words proposed by Devonish (1989) is different from most other treatments, which postulate primary stress and Low tone on the penult, and High tone on the final syllable. Noting that tone languages with lexically distinctive stress are very rare, Devonish (1989: 60) proposes the following analysis. The penultimate syllable of words like _π*'lora* would have an underlying High tone, in addition to the High associated with the final syllable in the other analyses. Devonish then presents an ad hoc explanation of how this High tone on the penult would give rise to the realisation of stress, and why it does not surface in the pitch contour. Both the penultimate and final syllables of tone II words such as _π*'lora* ‘to turn’ are thus stressed in Devonish’s account, as both have an underlying High tone. Similarly, other authors have argued that both (Birmingham 1970: 5) or neither (Goilo 1962: 11) of the syllables in words like _π*'lora* have stress. In summary, all previous studies agree that there is lexically specified tone in Papiamentu. With the exception of Devonish (1989), most authors additionally postulate an independent stress contrast.

Rivera-Castillo & Pickering (2004) present the most detailed phonetic analysis of Papiamentu prosody developed so far. The authors assume that the phonological analyses on the basis of impressionistic evidence are essentially correct, in that each syllable should be lexically specified for tone. Their results with respect to the marking of tone and stress suggest that High tones have higher F0 values, and that stressed syllables have a greater duration.² It is hard to draw any conclusions from this study, as the measurements – on speech from a single speaker of the Aruba dialect – are neither summarised by means of descriptive statistics, nor subjected to inferential statistical tests, nor controlled for segmental perturbation.

As noted above, most previous analyses have tones specified for each syllable, but the distribution of High tones turns out to be severely constrained, with most words having exactly one. In a reinterpretation

² Vowel quality and intensity were not measured as potential acoustic correlates of stress.

of the data presented in previous studies, Remijsen (2002: 587–588) hypothesises that the tone contrast of Papiamentu is of the ‘lexical pitch-accent’ type, similar to the tonal contrast of Tokyo Japanese (Beckman 1986). That is, one syllable per word would be marked, and this mark would be interpreted as high pitch at some level of representation (cf. Hyman 1981). The penultimate syllable would be marked in this way in _I‘lora ‘parrot’ and the final syllable in _{II}‘lora ‘to turn’ – i.e. ‘lóra vs. ‘lorá. The Low syllables of previous analyses would instead be unmarked for tone.

The account of the Curaçao Papiamentu tone contrast proposed in the current paper, however, is fundamentally different, both from the traditional fully specified analyses, and also from the lexical pitch-accent interpretation in Remijsen (2002).

2.4 Alternative analysis: a privative interpretation of Curaçao Papiamentu tone

In this section we present a privative analysis of the Curaçao Papiamentu tone contrast, informed by accounts of privative tone in Swedish (e.g. Engstrand 1995, 1997, Riad 1998, to appear) and Limburg dialects of Dutch (e.g. Gussenhoven & van der Vliet 1999).

In our analysis, the fall on the penult of tone II words (cf. Figs 1b, c) is accounted for in terms of an associated contour LEXICAL TONE (HL). This is illustrated in (5a) and (b). The rise on the final syllable of tone II words is analysed as an intonational pitch accent (LH) – the PROMINENCE TONE. It is associated with the final syllable of a tone II word if it is focused in an affirmative declarative sentence. This means that the association of the prominence tone depends on the utterance context. The same goes for the low boundary tone, which is associated with the final syllable of the utterance. This context-dependence of LH is expressed in (5) by means of brackets. At face value, it would appear that the low end target of the lexical tone (HL) is superfluous, since the following prominence tone (LH) already contributes such a target. The LH is absent out of focus, though, and the low end target therefore needs to be part of the lexical specification. As seen in (5c), the tone pattern of tone I words is accounted for in terms of the prominence tone. The prominence tone is also associated in the citation form.

- (5) a. _{II}‘lora ‘to turn’ b. _{II}lo‘ra ‘turned’ c. _I‘lora ‘parrot’
- | | | |
|---------|----------|----------|
| l o r a | l o ‘r a | ‘l o r a |
| | | |
| HL (LH) | HL (LH) | (LH) |

The Curaçao Papiamentu prominence tone postulated in our analysis is an intonational – i.e. phrase-level – phenomenon. To account for its distribution, therefore, we need to briefly discuss the relation between information structure and the assignment of intonational pitch accents in

Curaçao Papiamentu. This discussion is limited to those aspects that are crucial to the evaluation of our hypothesis on the phonological representation of the Curaçao Papiamentu tone contrast. As a frame of reference, we use Ladd (1996: 160–167). When speakers of Curaçao Papiamentu want to highlight one specific word in an utterance, one of the strategies at their disposal is to mark an intonational pitch accent on that word, without deviating from the standard constituent order. This can be seen in (6), in which the association of tones is specified for the predicate of the answer only. In the answer in (6a), $\text{I}'kru'sada$ represents new information, and the speaker expresses the prominence of this word in the discourse by marking the prominence tone on it. When a word has the prominence tone due to its discourse prominence, like $\text{I}'kru'sada$ in (6a), we can say that the association of this tone is due to NARROW FOCUS. Similarly, there is narrow focus on $\text{I}'lora$ in (6b).

- (6) a. $\text{I}'Carlos$ ta $\text{II}'lora$ su $\text{I}'trùk$ na $\text{I}'ka'minda$?
 Carlos COP turn POS truck PREP road
 'Does Carlos turn his truck on the road?'

HL LH

| |

Nò, $\text{I}'Carlos$ ta $\text{II}'lora$ na $\text{I}'kru'sada$.
 NEG Carlos COP turn PREP intersection
 'No, Carlos turns at the intersection.'

- b. $\text{I}'Kòr'sou$ tin $\text{I}'fla'mingo$ na $\text{I}'mondi$?
 Curaçao have flamingo PREP countryside
 'Does Curaçao have flamingos in the countryside?'

LH

|

Nò, $\text{I}'Kòr'sou$ tin $\text{I}'lora$ na $\text{I}'mondi$.
 NEG Curaçao have parrot PREP countryside
 'No, Curaçao has parrots in the countryside.'

In short utterances, only one word in the predicate tends to have the prominence tone. In this way, the presence of the prominence tone on a word due to narrow focus implies that other words in the predicate remain unaccented. This is the case with the tone II word $\text{II}'lora$ in (6a). It does not have a prominence tone, because, unlike $\text{I}'kru'sada$, it does not represent new information in this utterance. We can say that $\text{II}'lora$ is OUT OF FOCUS. The same goes for $\text{I}'mondi$ in (6b).

In some utterances, there is no single word in the predicate that stands out in terms of its discourse prominence. In (7), for example, the whole predicate in the answer represents old information. In such situations, the prominence tone is associated with the leftmost content word of the predicate. In this case, this is the verb $\text{II}'lora$.

- (7) E _I'trùk-nan ta _{II}'lora na _I'Punda?
 ART truck-PL COP turn PREP Punda
 'Are the trucks turning in Punda?'

HLLH
 \ /
 Si, e _I'trùk-nan ta _{II}'lora na _I'Punda.
 AFF ART truck-PL COP turn PREP Punda
 'Yes, the trucks are turning in Punda.'

The same generalisation holds when the predicate is a noun phrase or a prepositional phrase. When a word receives an intonational pitch accent as a result of this default distribution, we refer to it as having **DEFAULT FOCUS**. Default-focus accentuation guarantees that every predicate has at least one intonational pitch accent. The same rule applies when the whole predicate represents new information – for example, in answer to a question such as *What happened?*

When a Curaçao Papiamentu word has the prominence tone, whether due to narrow focus or to the default accentuation rule, this tone associates with the stressed syllable, unless the stressed syllable has the lexical tone (HL), in which case the prominence tone associates with the post-stress syllable. This implies that in tone II words the HL lexical tone may be immediately followed by the low target of the prominence tone. The Obligatory Contour Principle (Leben 1973) can be invoked to delete one of the adjacent Ls in the underlying specification. The phonetic alignment of these structural associations of tone will be discussed in §3.2.

2.5 Summary

We agree with previous analyses that postulate that Curaçao Papiamentu has both stress and tone contrasts. However, we take issue with the hypothesis that the syllables of Curaçao Papiamentu words are fully specified for tone in the lexicon. According to our alternative analysis, there is an asymmetry between the formal representations underlying tone patterns I and II. We hypothesise that tone II involves a lexical tone, but that tone I does not. In other words, the Curaçao Papiamentu tone contrast is accounted for in terms of a privative lexical tone.

Our phonological analysis of the Curaçao Papiamentu tone patterns in declarative utterances predicts that tone II words will invariably show a fall in F0 on the penultimate syllable, due to the HL lexical tone. The tonal pattern of the final syllable of tone II words should depend on discourse prominence. We predict that a rise – the **LH** prominence tone – is realised in focused contexts, but not out of focus. With respect to tone I words, our hypothesis leads us to predict that an F0 rise is again associated with the stressed syllable when the word is in focus. In summary, our analysis predicts substantial variation in the F0 contours of utterances as a function of discourse prominence. This factor has not been considered in

the study of Curaçao Papiamentu prosody up to this point. If previous analyses are correct, the tone patterns of Curaçao Papiamentu words should not vary as a function of discourse prominence.

There is another difference between earlier studies and the alternative analysis proposed here. Studies such as Römer (1991), Rivera-Castillo (1998) and Kouwenberg (2004) analyse the Curaçao Papiamentu tone patterns in terms of level tones. A word like ₁*lora* 'parrot' would have a High tone on the initial syllable, and a Low tone on the final syllable. The verb _{II}*lora* 'to turn' would have a Low tone on the penult and a High tone on the final syllable. Our analysis, by contrast, makes crucial reference to contour tones (HL and LH).

§3 reports on an acoustic analysis of the word-level stress and tone contrasts of Curaçao Papiamentu, as realised in a number of discourse contexts. The results of this phonetic study shed light on the phonetic realisation of the Curaçao Papiamentu word-prosodic system, and allow us to evaluate which of the hypotheses outlined above can account for the facts in the more natural way.

3 A phonetic analysis of Curaçao Papiamentu word prosody

3.1 Methodology

3.1.1 *Data collection.* We investigated the realisation of Curaçao Papiamentu stress and tone contrasts in discourse contexts. By using minimal-set data, we could study these contrasts while keeping segmental influences constant. The sets were based on words with the segmental forms /lora/ and /baba/ (cf. (4)). Each of the six target words (two sets with three members each) was recorded in five contexts:³

(i) Sentence-final position; default focus. The whole predicate constitutes old information, and the target word is the leftmost content word in the predicate (App: §1).

(ii) Sentence-medial position; default focus. The whole predicate constitutes new information, and the target word is the leftmost content word in the predicate. (App: §2).

(iii) Sentence-medial position; out of focus. Narrow focus is on a word other than the target (App: §3).

(iv) Sentence-medial position; narrow focus. Narrow focus is on the target word (App: §4).

(v) Citation form. The target word constitutes a one-word utterance. The data were collected with the assistance of a female native speaker. Each target sentence was elicited by means of a precursor question,

³ The dataset was collected together with data relating to the inventory of intonational contours in Curaçao Papiamentu, which will not be discussed in this paper. The dataset is given in the Appendix.

uttered by the assistant, who communicated with the participant in Curaçao Papiamentu. The sentences were presented on paper. The participants were instructed to try to enact the dialogues, so that somebody listening to the recording would not be able to tell that the speaker was actually reading. Data collection took place over three recording sessions, spaced at least 24 hours apart, in order to avoid confusion between members of minimal sets, as some contrasts are not represented orthographically. In addition, the order of presentation was varied to control for order effects.

One question we had in relation to Curaçao Papiamentu word prosody could not be addressed through the analysis of the disyllabic minimal sets. For words like *'agui,la* and *'de'posi,to*, previous analyses have postulated a High tone on the final syllable, in addition to the one on the stressed antepenultimate syllable. Sentences were created specifically to provide information on this issue. They are listed in the Appendix (§5).

The dataset was recorded with eleven native speakers of Curaçao Papiamentu. All had grown up in the Willemstad area of Curaçao. In addition to Curaçao Papiamentu, all participants were fluent in Dutch. Data from two participants was not analysed. One of these speakers had difficulty with reading. The other had a cold at the time of the first session. This left data from nine native speakers (four men, five women; age range 24–64).

3.1.2 Data processing and analysis. The data from both the speaker and the assistant were recorded using close-talking microphones mounted on a headset (Shure SM10A). These signals were recorded digitally on separate channels (44.1 kHz, 16 bits). The utterances by the participant were segmented manually, target words being segmented at the phoneme level and other constituents at the word level.

The data were analysed acoustically using Praat (Boersma & Weenink 2005). Auditory inspection of the complete dataset in Praat suggested that between-speaker and within-speaker variation was limited. That is, within each context and word-prosodic condition, the speakers appeared to produce the utterances with the same tonal patterns. For this reason, we decided to use time-normalised tracks, averaged over speakers, as descriptive statistics of the F0 results. In the production of such graphs, constituents in the utterance are measured at a fixed number of points. In Fig. 2 below, for example, F0 in each of the segments of the target word (C1, V1, C2 and V2) was measured at five equidistant time points. The number of points varies depending on the relative interest of the constituent in the analysis. That is, while five values were collected for each of the segments in the target word, only seven values were collected for the syntactic subject of the utterance, which comprises many more segments. This difference is motivated by the relative lack of importance of the tonal contour of the syntactic subject in our investigation. F0 tracks were produced by the autocorrelation method implemented in the Praat software, followed by visual inspection of all tracks and manual correction of

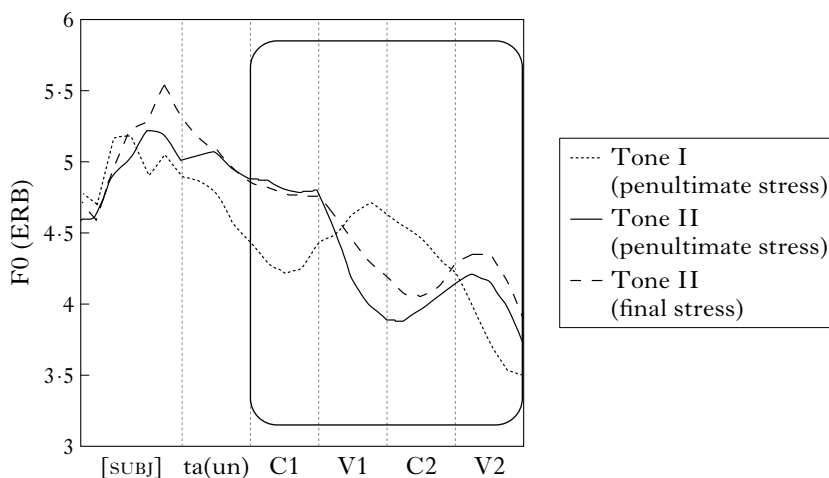


Figure 2

Averaged F0 trajectories for each of the three word-prosodic patterns, with default focus in sentence-final position (App: §1), over items and speakers, on a normalised time axis (104 tokens). The target word is highlighted.

octave errors. The Hertz values were then transformed to ERB values, averaged over tokens, items and speakers, and plotted.⁴ Our approach affords a detailed visual inspection of the tonal patterns, while at the same time generalising over realisations and speakers.

As potential correlates of stress, we measured segment durations, vowel quality (F1 and F2) and a relative measure of vowel intensity (dBr). dBr was computed by subtracting the mean overall utterance intensity from the mean value for the target vowel (both expressed in dB, with a frame length of 10 ms). F1 and F2 were measured for each vowel at its temporal mid point, using the Burg algorithm as implemented in Praat. Formant tracks were visually superposed on wideband spectrograms; whenever a discrepancy was noted between tracks and the spectrogram, the tracker settings were modified by hand, until a satisfactory match was obtained. Both the formant values and dBr were measured only for the out-of-focus condition. In this condition, there is no prosodic marking of focus on the target word, which could obscure the effect of stress. As a consequence, the out-of-focus condition offers the best perspective on the realisation of stress. With respect to fundamental frequency, we calculated the mean F0 and the F0 change for each vowel. The latter was computed by subtracting the ERB value at the vowel offset from that at the vowel onset. In this way, rises yield negative F0 change values and falls positive ones.

Two types of statistical tests were carried out on these measures: Linear Discriminant Analysis (LDA) and within-subject or repeated-measures

⁴ The ERB scale (Equivalent Rectangular Bandwidth) is a psycho-physical scale for speech melody (Hermes & van Gestel 1991, Nooteboom 1997).

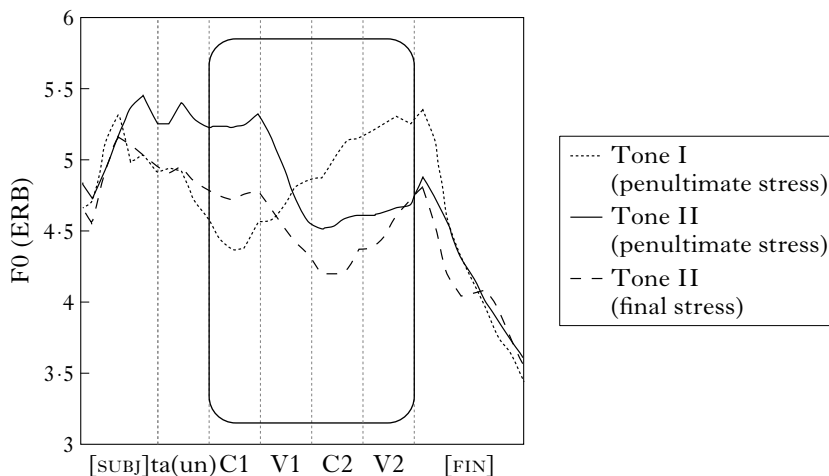


Figure 3

Averaged F0 trajectories for each of the three word-prosodic patterns, with default focus in sentence-medial position (App: §2), over items and speakers, on a normalised time axis (93 tokens). The target word is highlighted.

Analysis of Variance (RM-ANOVA). LDA allows us to determine how sensitive a given acoustic measure – e.g. vowel duration – is to a structural distinction – e.g. stress. The result can be expressed as the percentage of the dataset that can be correctly classified for a given feature on the basis of an acoustic measure, or set of measures. A detailed introduction to LDA can be found in Woods *et al.* (1986: 265–271). RM-ANOVAs were carried with the independent variables (factors) Tone contrast (tone I *vs.* tone II), Stress (penultimate *vs.* final) and Focus (i.e. level of discourse prominence: out of focus *vs.* default focus *vs.* narrow focus). Alpha was set at 0.01 for all ANOVAs and post hoc analyses.

3.2 Tone

In this section, we present a phonetic analysis of the Curaçao Papiamentu tone contrast in the following contexts: in sentence-final position with default focus (Fig. 2); in sentence-medial position with default focus (Fig. 3); in sentence-medial position with narrow focus (Fig. 4); and out of focus in sentence-medial position (Fig. 5). The figures show the F0 tracks of the three word-prosodic patterns overlaid in the same graphs. The citation-form realisations of the tone contrast were introduced in Fig. 1.⁵

⁵ The following labels are used in these figures. The label SUBJ indicates the grammatical subject, ‘ta(un)’ indicates the copula *ta* or the possessive copula *tin*, the former of which may be followed by the article *un*, the segments of the disyllabic target word are labelled C1, V1, C2, V2, and FIN stands for any constituent that may follow the target word: most often a prepositional phrase, otherwise the adverb ¹*kaba* ‘already’.

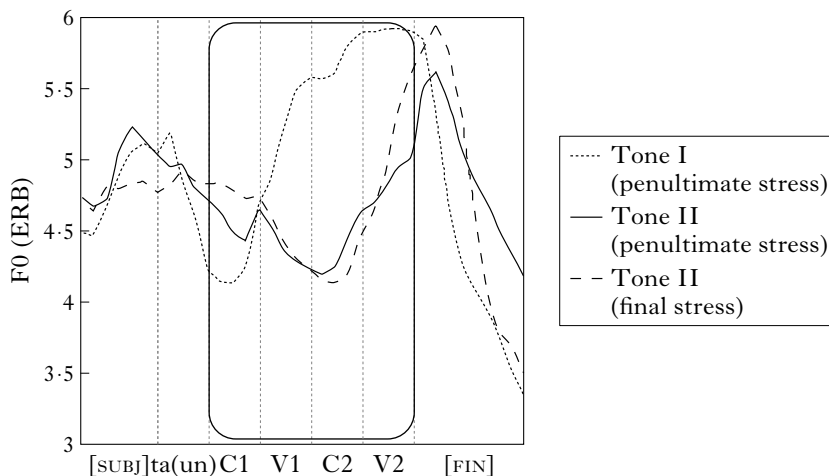


Figure 4

Averaged F0 trajectories for each of the three word-prosodic patterns, with narrow focus in sentence-medial position (App: §4), over items and speakers, on a normalised time axis (111 tokens). The target word is highlighted.

3.2.1 The melodic realisation of tone I. The tone I members of the minimal sets are ₁'lora 'parrot' and ₁'baba 'dribble'. According to our phonological analysis, tone I words can have the LH prominence tone associated with the stressed syllable. The prominence tone is an intonational pitch accent, the association of which depends on discourse prominence. This phonological analysis predicts considerable variation in the F0 contour on the penultimate syllable of ₁'lora and ₁'baba as a function of discourse prominence. Previous analyses predict no such variation.

The stressed penultimate syllable of tone I words shows a rising F0 contour in all contexts in which the word is in focus (Figs 1a, 2–4). This F0 rise starts in the syllable onset, and ends near the boundary between the penult and the final syllable. In sentence-final focused conditions (Figs 1a, 2), the rise is followed by a fall on the final syllable. Here we find that the end point of the rise on the penultimate syllable is aligned relatively earlier – approximately two-thirds into the vowel of the stressed penultimate syllable. In sentence-medial focused contexts (Figs 3, 4), the end point of the rise is aligned later, at the end of the onset of the final syllable, and it is followed by a high plateau. Crucially, there is no rise on the stressed penultimate syllable in the out-of-focus condition (Fig. 5).

In summary, the F0 pattern on the penultimate syllable varies as a function of discourse prominence: there is a rise when the word is in focus, contrasting with level F0 out of focus. The F0 pattern on the final syllable varies as a function of the position in the sentence: there is an F0 fall in sentence-final position, but a high plateau when there is a following phrase.

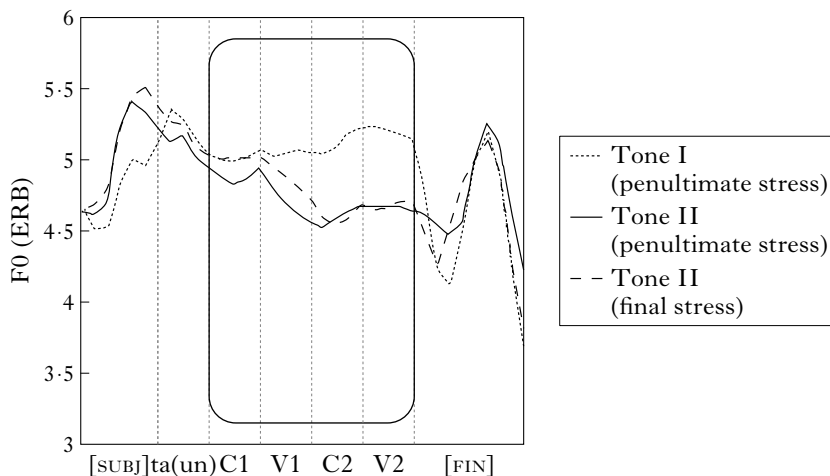


Figure 5

Averaged F0 trajectories for each of the three word-prosodic patterns, out of focus in sentence-medial position (App: §3), over items and speakers, on a normalised time axis (85 tokens). The target word is highlighted.

3.2.2 The melodic realisation of tone II. The tone II members of minimal sets are the verbs $_{II}$ 'lora 'to turn' and $_{II}$ 'baba 'to dribble', and their participles $_{II}$ lo'ra and $_{II}$ ba'ba. The base form and the participle of the verb differ in the location of stress, but are identical in terms of tonal specification. According to our hypothesis, a HL lexical tone is associated with the penultimate syllable of tone II words. In addition, they may have the LH prominence tone on the final syllable. The prominence tone is an intonational pitch accent, and its presence is conditioned by discourse prominence. The lexical tone, however, should be present in all contexts. As noted above, earlier accounts make no reference to discourse prominence as a factor in the specification of F0 patterns in Curaçao Papiamentu.

The penultimate syllable of tone II words shows an F0 fall in all contexts under consideration (Figs 1b, c, 2–5). The fall sets in at the start of the penultimate vowel, and continues up to or slightly into the onset of the final syllable. This steep drop should not be attributed to declination, i.e. the general downtrend pattern of F0 in the course of a sentence. First, this steep fall is aligned with the penultimate syllable: it sets in at the vowel onset of the penultimate syllable, and continues until the end of the vowel. Second, the fall is more than five times steeper than the declination rate, assuming the declination model of 't Hart *et al.* (1990: 128).⁶

⁶ Our calculation is based on the narrow-focus and out-of-focus subsets. 't Hart *et al.* (1990) model declination (D) in semitones (ST)/s, using the formula $(D = -11 / ([\text{utterance duration}] + 1.5))$. For an average utterance duration of 1514 ms, D is -3.64 . The fall over the penultimate vowel (94.5 ms) is -16 Hz, which corresponds to -1.85 ST, relative to the end F0 reference value of 141.3 Hz. This yields -19.6 ST/s, or $5.4 \times D$.

The F0 contour on the final syllable of tone II words depends on discourse prominence and the position of the word in the sentence. There is an F0 rise on the final syllable in all contexts in which the word is in focus (Figs 1b, c, 2–4). With respect to the sentence-medial contexts, the excursion size of this rise is greatest in narrow focus (Fig. 4). When the target word is elicited with default focus (Fig. 3), the averaged tracks show a moderate rise for final-stressed participle forms, and a shallow rise for the penult-stressed base forms. In sentence-final position (Figs 1b, c, 2) this F0 rise is also present, but now it reaches its high end point considerably earlier – in the first half of the vowel – as it is followed by a fall of F0 towards the end of the sentence. Crucially, the rise on the final syllable is absent when the words are out of focus (Fig. 5).

The phonetic realisation of tone II can be summarised as follows. Tone II words show a fall in F0 on the penultimate syllable. This fall is present irrespective of discourse prominence and position in the sentence. The final syllable of tone II words has rising F0, but only if the word is in focus. In sentence-final contexts, this rise is followed by a fall. This fall is a boundary phenomenon, independent of the pitch fluctuations that are the focus of the analysis.

3.2.3 Evaluation of the competing hypotheses. In §2.4 we argued for an analysis of the Curaçao Papiamentu tone contrast in terms of a privative lexical tone feature (HL), present only in tone II words. In addition, we postulated an intonational pitch accent – the LH prominence tone – to account for the tone pattern of the stressed penultimate syllable of tone I words and that of the final syllable of tone II words. Our hypothesis is supported by the F0 evidence presented in §§3.2.1–2. As predicted, the fall on the penultimate syllable of tone II words is realised irrespective of discourse prominence. By contrast, the F0 pattern on the stressed penultimate syllable of tone I words and on the final syllable of tone II words varies as a function of discourse prominence. In most earlier analyses of Curaçao Papiamentu prosody (e.g. Römer 1991, Rivera-Castillo 1998), all syllables are lexically specified for tone, and no reference is made to discourse prominence. As a result, these analyses cannot account for the influence of this factor on the F0 pattern of Curaçao Papiamentu words.

In the following two subsections, we report the results of statistical tests of our hypotheses. These tests confirm that the averaged F0 traces in Figs 1–5 reflect systematic differences as a function of Tone and Focus.

3.2.4 Quantitative tests 1: the influence of discourse prominence. If our hypothesis is correct, then the F0 pattern of syllables with which the prominence tone would associate – the penult of tone I words and the final syllable of tone II words – should clearly distinguish between levels of discourse prominence (Focus). Our hypothesis makes the opposite prediction for the penult of tone II words – which would accommodate the lexical tone. Its F0 pattern should not vary as a function of Focus.

In an RM-ANOVA with only the tone I items, Focus (the only factor) had a significant effect on the F0 change on the penult ($F(2,16) = 46.7$; $p < 0.001$). For the same factor (Focus) we also carried out two RM-ANOVAs on only the tone II items, one using the F0 change on the penult as the dependent, and the other using the F0 change on the final syllable as the dependent. Focus was significant with each dependent, but the effect of F0 change was considerably smaller for the penult ($F(2,16) = 8.3$; $p = 0.0003$) than for the final syllable (dependent LH: $F(2,16) = 48.1$; $p < 0.001$).

These ANOVAs reveal a difference in sensitivity to discourse prominence between, on the one hand, the F0 pattern on the penultimate syllable of tone II words and, on the other hand, the F0 pattern on the penultimate syllable of tone I words and on the final syllable of tone II words. LDAs show this difference even more clearly. For tone I words, the F0 change on the penult yields a correct classification for Focus in 78.8% of the cases. For tone II items, the F0 change on the final syllable yields correct classification for 60.5% of the tokens. Since the factor Focus has three levels (narrow focus, default focus, out of focus), these results should be interpreted relative to a 33.3% chance-level baseline. They contrast with the result of an LDA in which the F0 change on the penult of tone II words is used to classify Focus. Here the correct classification score is only 38.9%, close to the 33.3% chance-level baseline. In conclusion, the variation in F0 pattern of the penultimate syllable of tone I words and of the final syllable of tone II words affords discrimination between levels of discourse prominence well above chance level. The F0 pattern of the penult of tone II words does not.

3.2.5 Quantitative tests 2: contours or levels. Our phonological analysis of tone patterns I and II involves contour tones, HL and LH, with the tone components aligned with the edges of the syllable nucleus. In earlier analyses, the tone patterns were accounted for in terms of level tones, L and H, associated with syllables. Evidence from the averaged F0 in tracks Figs 1–5 suggests that an account that models tone I and tone II in terms of contours is indeed more accurate. We will now present further quantitative evidence on this issue.

We applied LDA to the contrast between tone I and tone II, over the three sentence-medial contexts. With respect to words with tone II, only the words with penultimate stress were included. These words constitute minimal pairs for tone with the tone I words in the dataset, which also have penultimate stress. In an LDA with mean F0 of the first syllable as the predictor, 71.5% of the cases could be classified correctly for Tone (tone I *vs.* tone II). The same analysis, now with the F0 change over the first vowel as the postdictor, resulted in a correct classification result of 92%.⁷ Clearly, the lexical tone contrast can best be analysed in terms of F0 change.

⁷ Mean F0 and F0 change were both based on measurements in ERB. The mean F0 values were standardised per speaker (z-transform) to control for between-speaker

When we only consider the out-of-focus condition, correct classification on the basis of the F0 change over the first vowel is 84.2%. We can conclude from this result that the contrast between tone I and tone II is still marked on the penultimate, even if the target words are out of focus. As suggested by Fig. 5, the flat F0 on the penultimate syllable of tone I words contrasts with the steep fall on the penult of tone II words.

In conclusion, both impressionistic inspection of the descriptive statistics and quantitative analyses confirm that the Curaçao Papiamentu tone contrast is phonetically realised by F0 changes over the vowel. This finding contradicts earlier analyses such as Römer (1991: 3), which primarily involve level tones. However, the interpretation of the Curaçao Papiamentu tonal configurations as level tones in previous analyses is in line with experimental results on the perception of non-speech synthetic F0 movements. Nábělek *et al.* (1970) found that subjects perceive the pitch of F0 movements within the range between mean frequency and the end frequency. In other words, the human auditory system is prone to interpret F0 rises as high tones, and F0 falls as low tones. From the perspective of these experimental findings by Nábělek *et al.*, then, it does not come as a surprise that the lexical tone (HL) was described in earlier studies as a Low tone, and the prominence tone (LH) as a High tone.

3.3 Primary stress and secondary stress

3.3.1 Primary stress. In this section, we report the results of a study on the realisation of primary stress in Curaçao Papiamentu. Across languages, primary word stress is acoustically encoded by a combination of duration, intensity-related parameters and vowel quality (Sluijter & van Heuven 1996, Gussenhoven 2004: 14–15). We carried out measurements of these prosodic parameters in minimal sets, uttered out of focus in sentence-medial position (App: §3). In this context, neither boundary-induced processes nor focus-induced prominence affect the prosodic realisation of the target word. The descriptive statistics are presented in Table I.

The vowels of stressed syllables are longer than those of unstressed syllables – 114 *vs.* 70 ms respectively, on average. This result confirms the observations of Rivera-Castillo & Pickering (2004). Stressed vowels also have more intensity than vowels of unstressed syllables – 2.5 dB, on average, relative to the mean intensity of the whole sentence. Finally, unstressed Curaçao Papiamentu vowels tend to be centralised, i.e. more schwa-like, as compared to their stressed counterparts. Unlike the measurements for duration and intensity, the influence of centralisation on vowel formants is conditioned by vowel quality. That is, whereas centralised [a] has a lower F1 than its peripheral counterpart, centralised [o] stands out from peripheral [o] primarily by its higher F2. Indeed, we find differences in the relevant formant as a function of stress, for both

variation in register. Both results are to be interpreted relative to a 50% chance-level baseline.

	σ	duration	dBr	Formants	
				/a/ (F1)	/o/ (F2)
Tone I (penultimate stress) e.g. _I 'lora 'parrot'	1	123 (25)	7.6 (2.3)	780 (78)	1035 (120)
	2	69 (15)	5.2 (1.4)	690 (98)	
Tone II (penultimate stress) e.g. _{II} 'lora 'to turn'	1	110 (31)	8.2 (3.2)	751 (69)	1065 (275)
	2	66 (11)	5.7 (2.2)	661 (92)	
Tone II (final stress) e.g. _{II} lo'ra 'turned'	1	79 (19)	6.0 (2.2)	674 (117)	1244 (172)
	2	112 (25)	8.4 (1.6)	790 (102)	

Table I

Means and standard deviations (parentheses) for duration (ms), relative intensity (dBr) and vowel quality (F1, F2). Separate values for the vowels of each syllable (σ) of each word-prosodic pattern in the minimal sets. Data from the sentence-medial out-of-focus condition only, over speakers and items (85 word tokens in total).

/a/ and /o/, and in the predicted direction: the F1 of stressed /a/ is about 100 Hz higher than that of unstressed /a/, and the F2 of stressed /o/ is about 200 Hz lower than that of unstressed /o/.⁸

The tendencies observed in the descriptive statistics are confirmed in statistical tests (ANOVA and LDA). We applied LDA to the factor Stress (penult *vs.* final), again out of focus in sentence-medial context. Only the tone II words were included in the analysis, i.e. the items that differ only in the location of primary stress. The highest classification score was obtained with the duration of the final-syllable vowel, expressed as a proportion of the total word duration (hereafter proportional V2 duration). This postdictor yields the correct result in 98.2 % of the tokens (chance = 50 %). The F1 of vowels /a/ and the relative vowel intensity result in smaller correct classification scores, of 82.9 % and 69.4 % respectively. In the same subset of the data, a within-subject ANOVA with the factor Stress and proportional V2 duration as the dependent was highly significant ($F(1,8) = 69.8$; $p < 0.001$).

We then carried out LDAs to determine which combination of acoustic measures yields the highest correct classification for both Stress and Tone simultaneously. The most successful model used proportional V2 duration and F0 change of V1. Over all three levels of Focus, an LDA with a combination of these two measures yielded 93.8 % correct for both Tone and Stress. The results for each level of Focus individually are the following. For the out-of-focus condition, correct classification on the basis of the two above-mentioned measures still stands at 84.7 %. The correct classification scores for the default focus and narrow focus contexts

⁸ The vowel /o/ only occurs in the penultimate syllable of the /lora/ minimal set.

are 97.8% and 99.1% respectively (chance = 33.3%). These high scores indicate that the averaged F0 tracks in Figs 2–5 reflect consistent trends in the dataset.⁹

In conclusion, the marking of stress in Curaçao Papiamentu is similar to the situation in other languages that have realised word-level stress prominence. Just as in English and Dutch (Sluijter 1995), for example, the vowels of stressed syllables in Curaçao Papiamentu have a greater duration and greater intensity, and are more peripheral in the vowel space. Interestingly, this stress prominence is lexically distinctive, independent of the lexical tone contrast.

3.3.2 Secondary stress. Some of the previous analyses distinguish two high tones in monomorphemic words with antepenultimate stress – e.g. *agui₁la* and *de'posi₁to* (cf. §2.2.2). For example, Kouwenberg's (2004) transcriptions of these two words can be represented in IPA as /á'gilá/ and /dè'pósitó/. Our analysis of such words does not involve lexical specification of tone at all. Instead, we have postulated the LH prominence tone, an intonational pitch accent that may associate with the syllable that has primary stress. We do hypothesise, however, that the final syllable has a different, non-tonal prominence: secondary stress. Kouwenberg & Murray (1994: 14) postulate secondary stress on the final syllable, and write that it is realised as High tone by some speakers. The editors of Römer (1991: 47–48) make a similar statement.

This controversy about the tonal specification of the final syllable of words like *agui₁la* and *de'posi₁to* bears on the interpretation of the nature of the Curaçao Papiamentu tone system. In particular, the transcription of such words with High tone both on the antepenultimate and on the final syllable suggests a more extensive lexical specification of tone than is supported by our privative analysis. That is why we investigated this issue by means of a phonetic analysis.

We measured the duration and F0 change of all vowels in the words *agui₁la* and *de'posi₁to*, as uttered sentence-medially by all nine speakers. The former word was recorded in four different frame sentences, the latter in two. The dataset is included in the Appendix (§5). The durations of each vowel in each of these words are presented in Table II.¹⁰ Table II shows that the mean duration of the final syllable (98 ms) is considerably greater than that of the penultimate (55 ms), and, in the case of *de'posi₁to*, of the unstressed pre-antepenultimate syllable (57 ms). F0 change, however, does not distinguish the final syllable from the penultimate or from the pre-antepenultimate syllable – all of these have falling F0, as evidenced by the positive values for F0 change. In summary, the final syllable of words with antepenultimate stress stands out by greater

⁹ We do not discuss the interaction of Stress × Focus, as this issue is largely irrelevant to our main questions.

¹⁰ In the case of *de'posi₁to*, data could only be analysed for seven of the nine speakers, because in the realisation by the remaining two, the vowel of the third syllable was elided altogether.

		pre- antepenult	antepenult	penult	final
₁ 'agui ₁ la	duration	—	112 (15)	60 (14)	104 (20)
	F0 change	—	−0.56 (0.42)	0.28 (0.18)	0.30 (0.33)
₁ de'posi ₁ to	duration	57 (11)	115 (12)	50 (13)	83 (9)
	F0 change	0.24 (0.19)	−0.49 (0.41)	0.70 (0.39)	0.42 (0.26)
<i>both</i>	duration	57 (11)	113 (14)	57 (14)	98 (20)
	F0 change	0.24 (0.19)	−0.54 (0.41)	0.40 (0.32)	0.33 (0.32)

Table II

Means and standard deviations (parentheses) for duration (ms) and F0 change (cf. §3.1.2), for each vowel in ₁'agui₁la and ₁de'posi₁to, over tokens and speakers.

duration rather than F0. This result is in line with the hypothesis that the final syllable has secondary stress.

These observations on the basis of the descriptive statistics are confirmed by inferential tests. In an RM-ANOVA, Syllable position has a significant effect on the dependent vowel duration ($F(3,9)=102.2$; $p<0.001$). Post hoc Bonferroni tests show that the vowels of the antepenultimate and the final syllables each differ significantly from all other vowels. The vowels of the pre-antepenultimate and the penultimate syllables, on the other hand, do not differ from one another. This is to be expected, given that both are unstressed. In a second RM-ANOVA, Syllable position also had a significant effect on the dependent F0 change ($F(3,9)=56.2$; $p<0.001$). In the post hoc Bonferroni test, the vowel of the antepenultimate syllable differs significantly from all other vowels in terms of F0 change. Crucially, the vowel of the final syllable is not significantly different from the vowels of the pre-antepenultimate and penultimate syllables, in terms of its tonal contour. In conclusion, these results indicate that, at least for the nine speakers in our sample, the final syllable of words with antepenultimate stress has secondary stress rather than a tonal specification.

4 Discussion and conclusion

4.1 Main findings

Earlier accounts hypothesise that Curaçao Papiamentu has both distinctive stress and a tone contrast. Our results corroborate this. We have carried out detailed acoustic analyses of these contrasts in disyllabic minimal sets. The analysis of the tone contrast supports a phonological analysis in terms of a privative lexical tone, present only in tone II words. In addition, our analysis involves a prominence tone, which – in

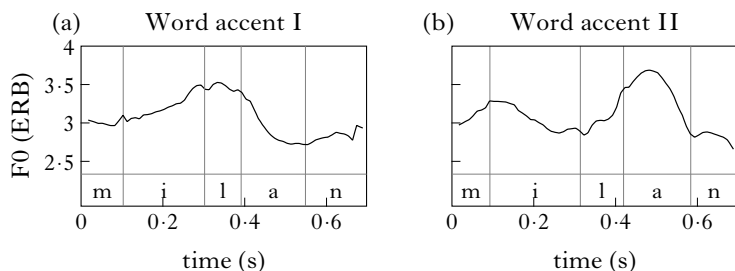


Figure 6

F0 trajectories illustrating the Stockholm Swedish tone contrast in a minimal pair: (a) '*Milan* 'Milan'; (b) '*milan* 'the charcoal stack'. Uttered in utterance-final position in: *Det var* [target word]. 'It was [target word]'.

Based on sound data from Olle Engstrand.

appropriate contexts – is associated with the stressed syllable of tone I words, and with the final syllable of tone II words. Crucial support for a privative interpretation of the tone contrast comes from the fact that the tonal pattern on the stressed syllable of tone I words is dependent on discourse prominence. The tonal pattern of the penultimate syllable of tone II words, on the other hand, is relatively stable. This asymmetry supports the hypothesised fundamental difference in the phonological representation of these tone patterns.

4.2 Curaçao Papiamentu tone compared with Stockholm Swedish word accent

There are striking similarities between the word-level tone system of Curaçao Papiamentu and certain Scandinavian word-accent systems. Word-accent systems involve a lexical tone contrast that is restricted to the syllable that has realised primary stress. A minimal pair example from Stockholm Swedish is '*Milan* 'Milan (Italian football team)' *vs.* '*mila-n* 'charcoal stack + DEF ART' (Olle Engstrand, personal communication). Both of these words have penultimate stress, realised by prosodic parameters other than F0. They are distinguished by their tonal pattern. As seen in Fig. 6a, word accent I involves a single peak, aligned late in the stressed syllable of '*Milan*. Word accent II is illustrated in Fig. 6b. It involves a fall on the stressed vowel of '*mila-n*, followed by a rise.

Riad's phonological analysis of this contrast in Stockholm Swedish is presented in (8) (1998, to appear). In Riad's analysis, the crucial difference between the two word-accentual patterns is that word accent II (8b) involves a H lexical tone, which word accent I lacks.¹¹ This lexical tone is aligned early in the stressed syllable. Depending on considerations

¹¹ A privative analysis of word accent is also proposed for East Norwegian by Lorentz (1995), and for several Limburgian dialects of Dutch (Gussenhoven & van der Vliet 1999).

relating to information structure, the stressed syllable may be the point of association of a ‘prominence tone’ (LH) – an intonational pitch accent. In an accent I word (8a), the prominence tone links up with the stressed syllable itself. In an accent II word (8b), the prominence tone is realised after the lexical tone. Interpolation between the lexical H and the following LH prominence tone accounts for the fall–rise pattern characteristic of word accent II. The low target at the end of both patterns in Fig. 6 is the low boundary tone (L%) – its association depends on the position of the word in the sentence.

(8) a. *Word accent I*

'm i l a n 'Milan'
 | |
 LH L%

b. *Word accent II*

'm i l a n 'the charcoal stack'
 / \
 H LH L%

In summary, Riad analyses the Stockholm Swedish tone contrast in privative terms: accent II words have a tone feature, and the contrast with accent I words hinges on the absence of this feature in the latter. Riad's analysis builds on phonetic evidence presented by Engstrand (1995, 1997). Engstrand shows that accent II words consistently have a fall in F0 on the stressed syllable, irrespective of focus. He found no evidence for a lexical specification of F0 in accent I words.

A comparison of the Stockholm Swedish minimal pair in Fig. 6 with the Curaçao Papiamentu minimal pair for tone in Figs 1a, b reveals that the tonal contours of Stockholm Swedish word accents I and II are very similar to those of Curaçao Papiamentu tones I and II respectively. These similarities are paralleled by correspondences in the formal analysis of the tone contrasts, which are summarised in (9).

(9) a. *Stockholm Swedish* (Riad)

Word accent II
 H LH L%
 └─┬─┘
 Word accent I

b. *Curaçao Papiamentu* (this paper)

Tone II
 HL LH L%
 └─┬─┘
 Tone I

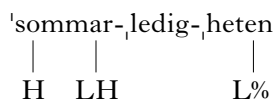
As seen from (9), Stockholm Swedish and Curaçao Papiamentu are both hypothesised to have a privative lexical tone contrast, and a prominence-marking intonational pitch accent. In both languages, the intonational pitch accent lines up to the right of the lexical tone. The phonetic realisations of these tones are also shared – in particular, the lexical tone is realised whatever the level of discourse prominence and the phrasal context.

There are also some non-trivial differences. The most important is that the lexical tone in Stockholm Swedish is invariably associated with the syllable that has primary stress. As we saw earlier, this is not the case in

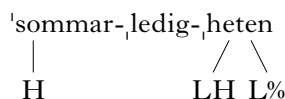
Curaçao Papiamentu. Most disyllabic verbs have the lexical tone associated with the penultimate syllable – the defining characteristic of tone II. But while stress is on the penultimate syllable in the base form, it is not in the corresponding participle, which has final stress.

A second difference has to do with the association of the prominence tone. Riad (to appear) reports that there is interesting variation among dialects of Swedish and Norwegian in the way in which the prominence tone is associated in compounds. (10) shows the surface association of tones in the compound 'sommər-ledig-heten 'the summer holidays', in two Scandinavian dialects, based on examples in Riad (to appear). In dialects such as Stavanger Norwegian (10a), the prominence tone is realised invariably on the syllable immediately after the one that bears the lexical tone. In Stockholm Swedish (10b), however, the prominence tone is associated with the last secondarily stressed syllable in the word, and with the post-stress syllable only in the absence of a following secondary stress. In Curaçao Papiamentu, by contrast, tone II is restricted to disyllabic words. Given that the lexical tone associates with the penult, it would appear that the prominence tone can only associate with the post-stress syllable in the surface structure.¹²

(10) a. *Stavanger Norwegian*



b. *Stockholm Swedish*



A third difference has to do with the phonological representation of the lexical tone. Its acoustic realisation appears to be the same in Curaçao Papiamentu and Scandinavian word-accent systems such as Stockholm Swedish and Stavanger Norwegian. Riad analyses the lexical tone as a High, early-aligned in the stressed syllable. The low end target comes either from the phonological representation of the prominence tone (in focus) or from the boundary tone (out of focus) – both of these are hypothesised to spread leftward in the dialects under consideration. The phonetic evidence presented in this paper could support a mono-tonal analysis for the Curaçao Papiamentu lexical tone. Instead, we have represented the fall of the lexical tone as an HL contour, because at this stage we do not know enough about Curaçao Papiamentu intonational phonology.

4.3 Hybrid word-prosodic systems

In this section we consider other reports of 'hybrid' word-prosodic systems, i.e. languages in which at least some words have both realised

¹² It is conceivable, though, that in deverbal derivations such as _{II}'gana 'to win' → _I'gana-'do 'winner', the resulting noun actually retains the lexical tone on the initial syllable – i.e. _{II}'gana-'do. If so, it is likely that the prominence tone would associate with the stressed syllable. We have no phonetic data crucial to this issue.

stress and some lexical specification for tone. In the Amazonian language Pirahã, each syllable is specified for tone, but, independently, there is also stress, predictable on the basis of syllable weight (Everett 1998). Lexical tone contrast in combination with fixed stress has been reported for a number of languages, including Diuxi Mixtec (Pike & Oram 1976)¹³ and several Bantu languages (Downing, to appear).

To the best of our knowledge, Curaçao Papiamentu is the only language that combines a privative tone contrast with lexically distinctive stress. The Austronesian language Ma'ya combines distinctive stress with a three-member lexical tone contrast (Remijsen 2002). (11) shows minimal-set evidence of stress and tone contrasts in the Salawati dialect of Ma'ya.

(11) *Minimal contrasts of tone and stress in Salawati Ma'ya*

a. *Tone contrasts*

<i>high</i>	'sá	'to climb'	'ná	'sugar palm'
<i>rise</i>	'sǎ	'to sweep'	'nǎ	'sky'
<i>fall</i>	'sâ	'one'	'nâ	'belly 3SG'

b. *Stress contrasts*

<i>penultimate</i>	'talá	'banana'	'maná	'light (of weight)'
<i>final</i>	ta'lá	'k.o. plant'	ma'ná	'grease'

The Ma'ya tone contrast is restricted to the stem-final syllable of content words. Stress is distinctive – it falls either on the final syllable or on the penult. A phonetic investigation revealed that Ma'ya stress is realised by duration, vowel quality and spectral balance, a parameter related to intensity. These measures are well-known correlates of stress in other languages, such as English and Dutch (Sluijter & van Heuven 1996). While stress is distinctive in Ma'ya, its distribution is not completely independent from the distribution of tone. In the Salawati dialect, penultimate stress is restricted to words that have either the High tone or no tone on the final syllable. In the Misool dialect, penultimate stress is only found in words that have either the Rise tone or no tone on the final syllable.

Hybrid word-prosodic systems contradict the view that a language can have no more than one word-level prosodic contrast. For example, systems like that of Curaçao Papiamentu and Ma'ya are ruled out by Clements & Ford (1979), and do not fit in the typology of Haraguchi (1988).¹⁴

It appears that lexical-tone systems and accentual systems with free (unpredictable) accent are mutually exclusive, in the sense that these two systems never coexist in the same language, characterizing the

¹³ Diuxi Mixtec has fixed stem-initial stress, realised by duration. The authors postulate a second stress on the final syllable in some words. They concede that this second hypothesised stress could be analysed alternatively in terms of tonal specification (Pike & Oram 1976: 331–332).

¹⁴ In these quotations, the term 'accent' encompasses the term stress as used earlier in this paper.

prosodic structure of the same lexical items (Clements & Ford 1979: 200–201).

Natural languages fall into two categories: those with an accentual system and those with a nonaccentual one. The former can in turn be classified into stress languages and pitch-accent languages (Haraguchi 1988: 123).

Clearly, languages like Curaçao Papiamentu and Ma'ya prompt a re-evaluation of such claims, and should encourage further research with respect to the theoretical modelling of word-prosodic typology.

4.4 Directions for future research on Curaçao Papiamentu prosody

We hope that this study will provide a solid and useful basis for further investigations into Papiamentu prosody. There are several remaining questions. One concerns between-dialect variation. Both in the Scandinavian (e.g. Riad, to appear) and in the Limburgian/Central-Franconian (e.g. Gussenhoven & van der Vliet 1999, Gussenhoven & Peters 2004) contexts, privative tone contrasts tend to show considerable between-dialect variation. Similarly significant variation may be found when comparing the tone system of the Curaçao dialect with that of other dialects, in particular that of Bonaire.¹⁵

In addition, now that we have a detailed understanding of the word-prosodic patterns, we can investigate how these patterns are affected by prosodic processes above the word. Römer (1991) reports that the default tone patterns are altered in negations, questions and imperatives. An analysis of this phenomenon in terms of the framework presented here is currently in progress. Also required is a detailed study of the 'polarisation' phenomenon reported in Römer (1991). This phenomenon might account for the high F0 found on word-final syllables, when their F0 pattern is not determined by a prominence tone or a boundary tone (cf. §3.2.1).

The analysis of the Curaçao Papiamentu tone contrast presented here could be improved or tested further in a number of ways. With respect to the alignment of tonal targets, our analysis is based on minimal sets with the structure CVCV. One consequence is that it is not possible to determine whether the end target of the prominence tone aligns with the left edge of any consonant that follows the vowel with which it is associated or, alternatively, with the left edge of the onset of the following syllable.

Finally, it would be interesting to find out if there are any stress-attracting affixes that cause the lexical tone and the prominence tone to be separated by one or more toneless syllables. This could have implications for the phonological representation of tone (cf. note 12).

¹⁵ We have collected data on the Aruba dialect. These data show considerably more between- and within-speaker variation than observed for the Curaçao dialect. This may be due to demographic developments on Aruba.

Appendix: The dataset

The italicised sentences were elicited from the subjects. The native-speaker assistant uttered the precursor questions. Words elicited with narrow focus on them are given in small capitals. In the default-focus set, all sentences begin with *si* 'yes'; in the narrow focus and out-of-focus sets, all sentences begin with *nò* 'no'. These words constitute separate intonational phrases, and are not represented in the figures. The standard Curaçao/Bonaire orthography is used; acute accents mark irregular stress patterns.

1 Sentence-final; default focus

Tone I

Ki sorto di para tin den e kouchi aki?	<i>Esaki ta un lora.</i>
What kind of bird is in this cage?	This is a parrot.
Ki sorto di líkido tin akibou na suela?	<i>Esaki ta baba.</i>
What kind of liquid is down here on the floor?	This is dribble.

Tone II (penultimate stress)

Kiko e trùknan ta hasi na krusada?	<i>E trùknan ta lora.</i>
What are the trucks doing at the intersection?	The trucks are turning.
Kiko e bebi ta hasi?	<i>E bebi ta baba.</i>
What is the baby doing?	The baby is dribbling.

Tone II (final stress)

Na unda e buki ta?	<i>E buki ta lorá.</i>
Where is the book?	The book is wrapped.
Dikon e klèchi ta muhá?	<i>E klechi ta babá.</i>
Why is the sheet wet?	The sheet has been dribbled on.

2 Sentence-medial; default focus

Tone I

Esaki ta un lora shinishi?	<i>Si, esaki ta un lora shinishi.</i>
Is this a grey parrot?	Yes, this is a grey parrot.
Esaki ta baba di bebi?	<i>Si, esaki ta baba di bebi.</i>
Is this baby's dribble?	Yes, this is baby's dribble.

Tone II (penultimate stress)

E trùknan ta lora na Punda?	<i>Si, e trùknan ta lora na Punda.</i>
Are the trucks turning in Punda?	Yes, the trucks are turning in Punda.
E bebi ta baba na krèsh?	<i>Si, e bebi ta baba na krèsh.</i>
Is the baby dribbling at the nursery?	Yes, the baby is dribbling at the nursery.

Tone II (final stress)

E regalo aki ta lorá na Ruba?	<i>Si, esaki ta lorá na Ruba.</i>
Has this present been wrapped on Aruba?	Yes, this one has been wrapped on Aruba.
E klechi ta babá na banda?	<i>Si, e klechi ta babá na banda.</i>
Has the edge of the sheet been dribbled on?	Yes, the edge of the sheet has been dribbled on.

3 Sentence-medial; out of focus

Tone I

- | | |
|--|--|
| Kòrsou tin lora na PUNDA? | <i>Nò, Kòrsou tin lora na MONDI.</i> |
| Does Curaçao have parrots in Punda? | No, Curaçao has parrots in the countryside. |
| E wig tin baba MEIMEI? | <i>Nò, e wig tin baba na BANDA.</i> |
| Is there dribble on the middle of the cot? | No, there is dribble on the side of the cot. |

Tone II (penultimate stress)

- | | |
|---|---|
| Carlos ta lora su trùk na KAMINDA? | <i>Nò, Carlos ta lora na KRUSADA.</i> |
| Does Carlos turn his truck on the road? | No, Carlos turns his truck at the intersection. |
| E bebi ta baba na KRÊSH? | <i>Nò, e bebi ta baba na KAS.</i> |
| Does the baby dribble at the nursery? | No, the baby dribble at home. |

Tone II (final stress)

- | | |
|---|---|
| E buki ta lorá na FÁBRIKA? | <i>Nò, e buki ta lorá na TIENDA.</i> |
| Was the book wrapped at the factory? | No, the book was wrapped in the shop. |
| E klechi ta babá MEIMEI? | <i>Nò, e klechi ta babá na BANDA.</i> |
| Was the middle of the sheet salivated on? | No, the side of the sheet was salivated on. |

4 Sentence-medial; narrow focus

Tone I

- | | |
|---|--|
| Ruba tin FLAMINGO na mondi? | <i>Nò, Ruba tin LORA na mondi.</i> |
| Has Aruba got flamingos on the countryside? | No, Aruba has parrots in the countryside. |
| E wig tin AWA na fòndo? | <i>Nò, e wig tin BABA na fòndo.</i> |
| Is there water on the bottom of the cot? | No, there is dribble on the bottom of the cot. |

Tone II (penultimate stress)

- | | |
|---|------------------------------------|
| Carlos ta BÈK su trùk? | <i>Nò, Carlos ta LORA su trùk.</i> |
| Does Carlos drive his truck in reverse? | No, Carlos turns his truck. |
| E bebi ta YORA na kas? | <i>Nò, e bebi ta BABA na kas.</i> |
| Does the baby cry at home? | No, the baby dribbles at home. |

Tone II (final stress)

- | | |
|--------------------------------------|--------------------------------------|
| E regalo ta HABRÍ ainda? | <i>Nò, e ta LORÁ kaba.</i> |
| Is the present still open? | No, it has been wrapped already. |
| E klechi den wig ta LIMPI ainda? | <i>Nò, e klechi ta BABÁ kaba.</i> |
| Is the sheet in the cot still clean? | No, it has already been dribbled on. |

5 Secondary stress

Ta kiko esaki ta?	<i>Esaki ta un depósito di papel.</i>
What is this?	This is a supply of paper.
Ta kiko esaki ta?	<i>Esaki ta un depósito di plaka.</i>
What is this?	This is a supply of money.
Ta kiko esaki ta?	<i>Esaki ta un águila di papel.</i>
What is this?	This is an eagle made of paper.
Ta kiko esaki ta?	<i>Esaki ta un águila di heru.</i>
What is this?	This is an eagle made of iron.
Ta kiko esaki ta?	<i>Esaki ta un águila nobo.</i>
What is this?	This is a new eagle.
Ta kiko esaki ta?	<i>Esaki ta un águila lihé.</i>
What is this?	This is a light eagle.

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