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ACCENT AND INTONATION IN A MALAGASY DIALECT

A Thesis submitted to the University of Wales

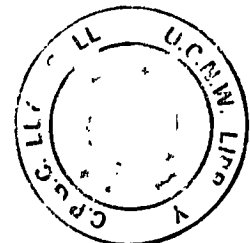
by

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in fulfilment of the requirements of the  
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School of English and Linguistics  
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1990



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However, I have only myself to blame for any inadequacies or errors in this thesis.

"The fear of the Lord  
is the beginning of wisdom,  
and knowledge of the Holy One  
is understanding."

(Proverbs 9:10)



## SUMMARY

Chapter 1 is an introduction to the Malagasy language and gives a historical background of how the notion of accent was introduced in the description of Malagasy phonology.

Chapter 2 deals with Malagasy words, their formation, their accent patterns and the rules which have been so far claimed to govern the accent patterns and the accent shift in Malagasy. New explanations are given concerning the stress shift in native Malagasy words as well as in loan words.

Chapter 3 covers a series of experiments on the judgment of accent (in words and in sentences) conducted by the present author on different groups of listeners, namely, linguistically trained and untrained speakers of different Malagasy dialects and Malagasy speakers' judgment of accent in a foreign language (Welsh-English).

Acoustic measurements of accent as judged by the informants are reported in Chapter 4 and evaluated statistically.

Chapter 5 discusses a previous theory of the Malagasy accent based on syntax. Evidence is given against such a theory.

A new theory is given in chapter 6, according to which accent in Malagasy is determined by intonation. Semantics seem to play a major role in delimiting intonation-groups.

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## CHAPTER 1

### INTRODUCTION

Malagasy is the language spoken on the island of Madagascar which is situated off the south eastern coast of Africa. However, the Malagasy language is not closely related to any African language -- as one would expect -- but rather to western Indonesian languages as a result of a migration of Austronesian speaking people to Madagascar by the beginning of the Christian era. Malagasy belongs to the Austronesian language family. It is not a tonal language.

The estimated eighteen dialects spoken throughout Madagascar have their roots in one common Malagasy language. The Merina dialect, which is spoken in the province of Antananarivo (the capital town of Madagascar), is the one under investigation in this thesis. It used to be referred to as the 'Ankova' or 'Hova' dialect in old publications. Native speakers of the Merina dialect number nearly 2 million (Atlas de Madagascar, 1969-1971), that is roughly 1/6 of the population of Madagascar. The present transcription of Merina with Roman letters goes back to the nineteenth century, following a royal decree issued in March 1823 which sanctioned the use of Roman letters as proposed, to a large extent, by Welsh missionaries.

## 1.1. Merina and Official Malagasy.

The distinction between the Merina dialect and the official Malagasy language has not been clear cut because, historically, the latter has derived from the former. As a result, Merina has often been considered as the 'Malagasy ofisialy' (official Malagasy). Official Malagasy is the language used in formal situations such as public speeches, sermons, in educational institutions, official documents and so on. Consequently, it is widely used throughout the country. The following criteria were suggested by Andrianasolo, F. (personal communication) to draw the line between the two. Official Malagasy is in its essence the written form of the Merina dialect as it was spoken 150 years ago (with some modifications) so that it is subject to fewer changes than the Merina dialect is. Official Malagasy contains words from other Malagasy dialects which are terms recently used in physics, mathematics, geography and so on. Certain phonemes of Official Malagasy are no longer found in present Merina (e.g. /h/).

For the sake of simplicity, the term 'Malagasy' in this thesis refers to one Malagasy dialect, namely the Merina dialect, as 'English' is used for referring to one variety of English, namely RP (Received Pronunciation). The reason for choosing that Malagasy dialect rather than another is simply the fact that it is the most familiar to the present author, it being her native dialect, and not

because of any concept of language prestige or superiority. In addition, since previous works dealing with Malagasy phonetics and phonology have been based on the Merina dialect (Rousselot 1913, Dahl 1952, Verguin 1955, Rakotofiringa 1978, Rafitoson 1980, Raoniarisoa 1986), the present research was aimed at bringing further contribution.

## 1.2. Malagasy 'accent'.

Historically, terms such as 'accent' -- in French -- (Abinal & Malzac 1899, Faublée 1946) or 'accent tonique' (Berthier 1922), or 'accent' -- in English -- (Griffiths 1853, Cousins 1873, Dahle 1877) were first introduced last century in descriptions of the Malagasy language by British, French and Norwegian missionaries. The same term 'accent' was subsequently used by the French (teachers and grammarians) during the colonization of Madagascar by France (1896-1960), and by Malagasy grammarians and linguists after the independence (Rajemisa Raolison 1966, Rajaona 1972). Accent (either in French or in English) referred to lexical accent. Nineteenth century publications (dictionaries, grammar-books, vocabulary-books, articles for the magazine 'Antananarivo Annual' and so on) in which this term appeared were mainly aimed at foreign learners of Malagasy (mostly missionaries) or for the interest of linguists or readers in the authors' home countries.

Hardly any definition of 'accent' was given; among the very few authors who gave one were Griffiths (1853, p.228) who put it this way "Accent is the Emphatic tone with which one syllable of a word is more forcibly sounded than the other, or others", and Berthier (1922, p.43) who defined, in a footnote, a 'syllabe tonique' as "la syllabe la plus aigue du mot \_ qui est aussi la plus intense, car en malgache la hauteur et l'intensité coincident generalement".

Sections on 'accent' in published articles or books were generally short or even non existant (as in Ferrand 1903). In some publications, 'accent' is indicated above syllables without any explanation. In Marre (1895) 'accent' was indicated in some words, e.g. <bétsaka> (many) and <saláma> (in good health), but not in many others, e.g. <manda> (to refuse), <aloka> (shadow) and so on. It was also indicated in phrases like <mpitendry lokánga> (violonist) but not in <mpikitika lokanga> (also violonist).

In an English-Malagasy vocabulary edited by native Malagasy speakers (Rabearana et al 1863) no 'accent' was indicated either at word or at phrase level. Thus <lalana> (law) -- today spelt <lalàna> -- and <lalana> (road) -- now spelt <làlana> -- were written the same. Had the Malagasy phrases and expressions compiled in that vocabulary been presented in alphabetical order, the authors might have made note of differences in pairs of words like <lalàna>-<làlana> above but, in any case, they are few in Malagasy.

Following the trends in syntactic descriptions in

Europe, most grammar-books on Malagasy dealt with classifications of Malagasy words into lexical and syntactic categories (often on the basis of their translation into French or English) and so on. Very short sections were devoted to 'accent'. But this is not surprising because in Europe too, very little attention was given to phonology and even less to prosody at that time.

Thus the term 'accent' -- as it was used in the nineteenth century and at the beginning of the twentieth century -- reflected primarily the non native speakers' auditory perception (as Griffiths's and Berthier's definitions above suggest). The term 'accent' was sometimes given a Malagasy form 'akisentra' by authors like Sewell (1875).

'Accent' in French is still used today by linguists -- native as well as non-native speakers of Malagasy -- in descriptions of Malagasy phonology: Dahl (1952), Rajaona (1972), Domenichini-Ramiaramanana (1977), Rakotofiringa (1978), Dez (1980), Rabenilaina (1983), Rafitoson (1980).

The current Malagasy term 'tsindrimpeo' (lit. 'tsindry'= pressing down and 'feo'=voice) is used in Malagasy grammar-books or at schools and universities to refer to lexical accent but it denotes an articulatory effort. Basically, it is the Malagasy substitute for 'accent' in French or in English in earlier publications.

### 1.3. Past works on accent and intonation in Malagasy.

In the study of the Malagasy language, as in many other languages, prosody has for a long time been a neglected area.

The first major work on Malagasy phonetics and phonology done by Dahl (1952) was mainly concerned with segmental phonology, so that the topic of accent and that of intonation were only sketched.

Rakotofiringa (1978) focussed on instrumental study of accent in Malagasy words, most of them in isolation. His work is probably the most comprehensive one -- up to date -- as far as the acoustic study of Malagasy accent and segments is concerned.

Rafitoson (1980) is -- to my knowledge -- the first who developed a theory of sentence accent in Malagasy and to provide a model of Malagasy intonation in declarative and interrogative sentences. She modifies Dahl's concept of secondary accent and accounts for the accentuation pattern of Malagasy sentences on the basis of syntactic structures in terms of syntactic functions, following the structural-functional tradition. Her theory is discussed in chapter 5 of this thesis. She views intonation as being independent of accent and describes a representation of Malagasy intonation, using the level approach.

#### 1.4. The present research.

Most investigators have based their theories on Malagasy accent on their own perception. Although phoneticians generally agree on accent placement at word level, there tends to be some difference of opinions on the degrees (or levels) of accent in phrases or sentences, let alone in multisyllabic / compound words.

This work is an attempt to analyse accent from a different view, that of listeners who are not phoneticians. Having been one herself before undertaking research in Malagasy phonetics and phonology, the present author has known the difficulty of judging what is 'accent' in Malagasy. Experiments on the perception of accent at word and at sentence levels by nonpartisan listeners are reported here in chapter 3. As will be seen in that chapter, untrained listeners do not perceive accent according to phoneticians' predictions.

In the light of the results obtained from those experiments, some previous theoretical assumptions concerning accent in Malagasy are reconsidered. One of such assumptions is that accent is associated with acoustic prominence, i.e. longer duration (Rafitoson 1980), higher intensity (Dahl 1952) or higher pitch (Rakotofiringa 1978). Although much has been done in that area, results differ from one researcher to another. The possibility of non acoustic factors being involved in the perception of accent

is also studied by comparing the physical correlates of accent as judged by native and by non native speakers.

Another assumption being reconsidered in this thesis is that accent is determined by syntax. The structural-functional approach to syntax has so far dominated in the analysis of Malagasy sentences and despite the excellent work by Rajaona (1972) to redefine syntactic terms in relation to Malagasy, much remains to be done in that field. The flexibility of word order in Malagasy is one of the main problems in the analysis of the relation between accent and syntax. In addition, different types of data like conversations, monologues, interviews and news broadcast provide new evidence against that claim and a different theory of accent is developed, which takes intonation into account. The principle which lies behind that theory is that accent is determined by intonation.

#### 1.5. Definition of accent.

Various definitions have been given to the term 'accent'.

A distinction between stress and accent was made by Bolinger (1958); stress referring to the syllable which has the potential for pitch obtrusion and accent to the prominence of a syllable when it has that pitch movement.

Other authors make the difference between stress and accent depending on whether the domain of prominence is a



word or a sentence (Cutler 1984).

Yet another distinction between stress and accent is made by Crystal (1969) depending on whether the major factor which makes a syllable prominent is loudness or pitch.

Such distinctions have to be kept in mind whenever 'stress' or 'accent' is found in quotations from studies in English but accent is the general term which is used here.

In this thesis, the word 'accent' refers to the relative prominence of a syllable at word level and at sentence level. It is, however, necessary to distinguish between accent as predicted by trained phoneticians and accent as judged by linguistically untrained informants. Since the former has mostly been associated with physical or rhythmic prominence, it will be referred to as the 'prominent' syllable and the latter as simply 'accented'. Any confusion of these two terms that the reader may find here is a remnant of the confusion which has resulted from the variety of definitions of stress and accent and from the difficulty to choose which of the English definitions would suit the French term 'accent' used in previous investigations in Malagasy. To illustrate the use of these terms here, a Malagasy sentence like

Manambady Dokotera Rateffy. (Doctor Ratefy is married)

Wa	Wa	Wa
P		P
Sa		

has three word (or lexical) accents (syllables marked with <Wa>), two prominence loci (marked with <P>) and one sentence accent (marked with <Sa>). However, this notation with <Wa> <P> and <Sa> is not used in the text but only in this introduction for clarification.

## CHAPTER 2

### WORD ACCENT

#### 2.1. Word formation.

'Word' in this chapter refers to the orthographic word. Words consist of at least one morpheme which is the smallest unit in morphology.

Malagasy is an agglutinative language. Words are either free morphemes, i.e. morphemes which can occur as separate words, such as <asa> (work), <nofy> (dream), <tapitra> (finished), <vita> (done) and so on, or a linear sequence of morphs which consist of a stem (in boldtype in examples below) and affixes, as in

Stem	Verb	Noun
<b>dio</b>	manadio (to clean)	fahadiovana (cleanliness)
asa(work)	miasa (to work)	fiasana (tool)
sambotra	misambotra (to catch)	fisamborana (catching)

Some morphemes are bound, i.e. always affixed, such as <dio>, <sambotra> and do not have a meaning on their own while others, like <lanitra> (sky) and <tantely> (honey), never occur in the bound form.

The distinction is often made between primary and secondary stems in Malagasy (Cousins 1873, Rajemisa-Raolison 1966, Dez 1968, 1980). Primary stems have one, two or three syllables. The majority of trisyllabic stems have the ending <-ka>, <-tra> or <-na> which, according to Dahl (1938, p.196; 1954, p.344), result from a phonological process of vowel addition to final consonants of the original Indonesian language due to the influence of a Bantu substratum (but see Simon 1987, p.76 for a different opinion). Secondary stems were originally affixed stems but because the affixes have no longer been productive for a long time, they are considered as part of the stem and therefore, they are treated in the same way as the primary stems as far as accent rules are concerned. Examples of secondary stems are <anjara> (share), <kilalao> (toy), <tomany> (mitomany = to cry) and so on.

Stems can be reduplicated as in, e.g. <vitsy> / <vitsivitsy> (a few), <mafy> / <mafimafy> (hard / loud), <mora> / <moramora> (slowly), <mena> / <menamena> (red) and so on. Two stems can also be used for making compounds which are written in one word such as <renivohitra> (capital city) from <reny> (mother) and <vohitra> (town), <ranomasina> (sea) from <rano> (water) and <masina> (salty),

<zazavavy> (girl) from <zaza> (child) and <vavy> (female) etc...

## 2.2. Word-accent rules.

### 2.2.1. In stems.

Among the first attempts to formulate accent rules in Malagasy were statements such as "the accent must be placed on the first syllable" (Cousins 1873, p.7) which was based on primary roots (stems) only. Any deviation from this rule was attributed to the former existence of prefixes in secondary stems or to foreign words borrowed from French, e.g. Fr. <café> Mlg. <kafe> (coffee) or from Arabic, e.g. Ar. <mizan> Mlg. <mizana> (scales).

Dahle (1877) attempted to give more satisfactory rules than the one above by saying that the accent is always on one of the last three syllables and that accent placement in the stem is determined phonologically, i.e. by the 'length' of vowels. For Dahle (1877) Malagasy vowels were either long (/e/ and the diphthongs) or intermediate (/i/ /u/) or short (/a/). His tentative rules can be summarized as follows: accent is on long vowels in final syllables; if the final vowel is not long (i.e. if it is intermediate or short) then accent is on the penultimate or antepenultimate vowel. Obviously, such rules were not accurate because accented /a/ /i/ and /u/ occur in final syllables of

Malagasy words.

There is a general agreement among investigators on Malagasy word-accent that it falls on one of the last three syllables in (primary and secondary) stems (Dahle 1877, p38; Dahl 1952, p.153; Verguin (1955, p.522), Rajaona 1972, p.332, Rakotofiringa 1978, p.68; Rafitoson 1980, p.131.). Most of those authors consider the case of proparoxytons ending in <-ka>, <-tra> and <-na> as an exception for one reason or another and that the location of accent can therefore be further confined to one of the last two syllables. As Rakotofiringa (1978, p.64) put it "-ka, -na et -tra, dans les mots accentués sur l'antépénultième, n'auraient pas de fonction particulière. Ce seraient des groupes phonétiques linguistiquement neutres, facultatif, et à ce titre, pourraient être négligés, au point de vue accentuation". In metrical theory, the final syllables <-ka>, <-tra> and <-na> would correspond to what is called 'extrametrical' syllables in English. The term 'extrametrical' has been introduced by Liberman and Prince (1977, p.292, 298) and developed by Hayes (1985) for calling a syllable which occurs at the edge of a domain (word / phrase) and which is "temporarily excluded from consideration by stress rules." (Hayes 1985, p.72 ).

### 2.2.2. In words.

When the number of syllables increases as resulting from the process of affixation, reduplication or compounding for forming Malagasy words, the agreement on accent placement on one of the last three syllables is maintained by most authors. There is also agreement concerning the existence of a second accent but authors disagree on its nature.

Rakotofiringa (1978), Domenichini-Ramiaramanana (1977) and Rajemisa-Raolison (1985) are of opinion that any free morpheme of four syllables or more have at least two accents, e.g.

[pulul<sup>1</sup>utra] (Domenichini-Ramiaramanana 1977, p.55)  
[tsikiriti] (Rakotofiringa 1978, p.89)  
    2 3 1 4  
alahelo (Rajemisa-Raolison 1985, p.992)

All three agree on the location of two accents which are respectively on the penult and on the initial syllable in the above examples but whereas the two accents are regarded as equal by Rajemisa-Raolison, they are treated as primary and secondary by the other two authors cited above.

A second accent can also be on a prefix or a combination of prefixes as illustrated by the following examples given by Dahle (1877, p.40) in <mámpan<sup>1</sup>déha>, <máhata<sup>1</sup>híry>, by Dahl (1952, p.196) as in <mifánka<sup>1</sup>házo>, by

Rafitoson (1980, p.129) in <mifámpijéry>, and by Rajemisa-Raolison (1985, p.992) in <fánamorána>.

In reduplicated and compound words there is a general agreement that each element maintains its accent, disregarding the number of unaccented syllables intervening between them, as in <fótsifótsy> from <fotsy> + <fotsy>, and in <mandrávasárotra> from <mandráva + sárotra> (Rajemisa-Raolison 1966, p.7), <vátolámpy> from <váto> + <lámpy> (Rakotofiringa 1978, p.90), to cite only a few. The accent on the prefix or in the first element of reduplicated or compound words is considered as a 'subordinate' or secondary one by Dahle (1877) and Dahl (1952), as opposed to the main accent (which is on one of the last three syllables), but as equal to the latter by Rajemisa-Raolison (1985) and Rafitoson (1980). Moreover, Dahl (1952, p.153) observed that "l'accent d'intensité secondaire, qu'on trouve souvent dans les mots très longs, n'appartient pas à la phonologie de la langue, étant d'un caractère rythmique seulement." For Rafitoson (1980) the distinction between primary and secondary accents exists only at the level of the phrase or of the sentence (which is partitioned into accentual groups) and depends on the position of the word in the accentual group. That is to say, if the word is in final position in an accentual group its last accented syllable carries primary accent, but if the word is in non final position in an accentual group its last accented syllable carries secondary accent (Rafitoson 1980, p.141).



In chapter 6 I will show that these accentual groups correspond to intonation-groups and that accent is conditioned by intonation. The case of suffixation is discussed in 2.3.3.1. below.

To sum up, as far as accent placement in Malagasy words is concerned, most authors agree that, as a rule, accent is on either the ultimate, penultimate or antepenultimate syllable in Malagasy words. Thus, accent in Malagasy is not fix but free. By convention, Malagasy accent is represented in the orthography when there is risk of confusion between pairs of words such as, e.g. <tànana> (hand) and <tanàna> (town); <manda> (wall) and <mandà> (to deny).

### 2.2.3. Accent shift.

Another rule which is agreed upon by most authors concerns the accent shift which accompanies the process of suffixation. In Malagasy, when the stem is suffixed, the accent shifts to one syllable towards the righthand side of the word, as in

[tsíndzu]	<tsinjo>	—>	[fitsíndzúvana]	<fitsinjovana>
[tadídi]	<tadidy>		[fitadidína]	<fitadidina>
[mandzáka]	<manjaka>		[fandzakána]	<fanjakana>
[fána]	<fana>		[afanána]	<hafanana>
[bédi]	<bedy>		[bedésina]	<bedesina>

The process of suffixation is often accompanied by phonological processes affecting the segments, such as vowel or consonant alternation, consonant insertion or elision of the final syllable of the stem (Dahl 1951, p.90; Raoniarisoa 1986, p.35-37). There are, of course, exceptions to the rule stated above, as in

[áina]	<aina>	--->	[fiáinana]	(life)
[fúna]	<fona>		[fifúnana]	(repentance)
[tána]	<tana>		[tánana]	(to be held)

The explanation for those exceptions is given in 2.3.3.1. below.

Accent shift occurs also when stems are suffixed in the imperative

[mandé]	<mandeha>	(to go)	--->	[mandeána]	(go!)
[miténi]	<miteny>	(to speak)		[mitenéna]	(speak!)
[midzúru]	<mijoro>	(to stand up)		[midzurú]	(stand up!)
[miláza]	<milaza>	(to say)		[milazá]	(say!)

Although the suffix does not show up in the pronunciation, as in the latter two examples, the accent shift is believed to have derived from the suffixation of [-a] which is lost in the pronunciation (also in [mande] /mandeha/ above) and which is sometimes represented in the

orthography [midzurú] <mijoroa> (Rajaona 1972, p.333). It appears that this suffixation with [-a] occurred in the original Indonesian language from which Malagasy was derived (Dahl 1951, p.91).

A problematic case in the rule of accent shift accompanying suffixation is that of bound morphemes which are possessive and agentive markers. The bound morphemes for possessive markers are

[-ku] <-ko> my	1st pers. sing
[-nau] <-nao> your	2nd pers. sing
[-ni] <-ny> his /her /their	3rd pers. sing.& plur
[-nai] <-nay> our (inclusive)	1st pers. plur
[-ntsika] <-ntsika> our (exclusive)	- " -
[-nareu] <-nareo> your	2nd pers. plur

When they are added to stems they carry accent except [-ku] 1st. pers. sing and [-ni] 3rd pers. sing. & plur. as in

[réni] --->	[réniku] <reniko> my mother
(mother)	[réninaú] <reninao> your mother
	[rénini] <reniny> his/ her / their mother
	[réninaí] <reninay> our mother (exclusive)
	[rénintsíka] <renintsika> -"- (inclusive)
	[réninaréu] <reninareo> your mother

The bound morphemes for agentive markers are identical to the morphemes for possessive markers above and the accent pattern of words containing such morphemes is also the same as above.

[íta] (seen)---> [ítaku] <hitako> seen by me  
[ítanáu] <hitanao> seen by you  
[ítani] <hitany> seen by him/her  
[ítanáí] <hitanay> seen by us (exclusive)  
[ítantsíka] <hitantsika> -"- (inclusive)  
[ítanaréu] <hitanareo> seen by you  
[ítani] <hitany> seen by them

Rakotofiringa (1978, p.91) goes round the problem by saying that some of the morphemes above are accented and some (namely [-ku] and [-ni]) are not. In addition, he states that the secondary accent is on the suffix [-ku] and [-ni] and presents a deviation from the accent rule but, according to him, such cases should be treated as compound words. Rafitoson (1980, p.129) adopts a similar strategy by classifying some of the morphemes among the 'monèmes accentogènes' and the others (i.e. [-ku] and [-ni]) among 'monèmes non accentogènes'. In 2.3.3.4. below an alternative explanation is suggested.

The distinctive function of accent in Malagasy which is often illustrated with classic examples such as [tanána] <tanàna> (town, village) vs. [tánana] <tànana> (hand), and [mandá] <mandà> (to refuse) vs. [mánda] <manda> (wall) and so on is explained by a historical stress shift (Rakotofiringa 1978, p.86). Phonological conditioning of this distinctive function is given by Andrinasolo (1988, pp.537-546).

### 2.3.. Accent in loan words.

The rules mentioned above concern native Malagasy words, i.e. words from the Common Indonesian language. Loan words from other languages such as Arabic, Swahili, French and English are also found in the Merina dialect. The latter two having been most influential especially since last century as a result of the presence of missionaries from the London Missionary Society on the island (from 1818 onwards), and of the colonization of Madagascar by France (1896-1960).

One may ask 'why bother about loan words? They are in minority and always constitute exceptions'. If Kessler (1870, p.11) is right in saying that "Among the 8,340 primitive words in the English and Malagasy Dictionary of Freeman and John's [1835], there are about 170 Malayan and Javanese, 6 Sanscrit, 9 Arabic, 12 Hebrew, 60 French and 10 English", then the number of French and English loan words has by today increased a hundred times. In Rajemisa-

Raolison's dictionary (1985) there are about 590 words with the entry 'French' and 'English' and this number does not include those which are borrowings from French or English but with the entry "Fiv.Kat" (catholic religion) or "Fiv.Prot." (Protestant religion), nor the many other foreign words which are in common usage among Malagasy people (educated as well as uneducated). With the growing number of new technical and technological terms, it is anticipated that the number of loan words will increase more and more over the next decades and that they may even outnumber the native Malagasy words one day. Therefore, it is worth paying attention to them. How do the foreign words fit in the accent rules of the Malagasy language?

### 2.3.1. From French.

French words do not seem to present any problem. Accent remains on the same syllable which is word-final in the original French words but corresponds to the ultimate, penultimate or antepenultimate syllable in the Malagasy borrowings.

-Accent on the ultimate syllable:

Fr. [frã sé]	--->	Mlg. [frantsái]	(French)
[kafé]		[kafé]	(coffee)
[lak <sup>y</sup> izín]		[lakuzí]	(the kitchen)
[ʃarbô]		[sarbó]	(coal)
[martó]		[martú]	(hammer)

-Accent on the penult:

Fr. [ɔpitáɪ]	--->	Mlg. [opitáli]	(hospital)
[gazét]		[gazéti]	(newspaper)
[póst]		[póstra]	(post office)
[sigár]		[sigára]	(cigarette)

-Accent on the antepenult:

Fr. [latábl]		Mlg. [latábatra]	(the table)
[lítɾ]		[lítatra]	(litre)
[kárt]		[káratra]	(card)
[métr]		[métatra]	(metre)

### 2.3.2. From English.

In loan words from English the same thing is observed but with less regularity. Many English words have been superseded by French ones and are no longer in use. Examples of English loan words in this chapter are mainly from Richardson (1885) and Abinal & Malzac (1899). Since a large number of English words end with a consonant, the final consonant opens into a syllable in Malagasy and therefore the accent becomes on the penult or on the antepenult in the Malagasy equivalent.

-Accent on the ultima:

Eng. [skrú:]	--->	Mlg. [sekirú]	(screw)
[dzulái]		[dzulái]	(July)

-Accent on the penult:

Eng. [sléit]	--->	Mlg. [suláitra]	(slate)
[búk]		[búki]	(book)
[tʃó:k]		[tsáuka]	(chalk)
[gi:s]		[gísa]	(geese)

-Accent on the antepenult:

Eng. [spé <sup>l</sup> lɪŋ]	[(t)spé <sup>l</sup> lɪna]	(spelling)
[pó <sup>l</sup> ɪz n]	[pu <sup>l</sup> ɪzɪna]	(poison)
[sív ]	[sívana]	(sieve)
[bó <sup>l</sup> :d]	[bó <sup>l</sup> ɪtra]	(board)
[sékənd]	[saíkina]	(second)
[bé <sup>l</sup> ɛnɪt]	[bé <sup>l</sup> ɪtra]	(bayonet)

In a large number of borrowed words from English, the accent has moved from the original English accented syllable to another one towards the end of the word,

Eng. [létə]	[litéra]	(letter)
[ɪŋglɪʃ]	[aŋgilísi]	(English)
[pé <sup>l</sup> nsɪl]	[pensíli]	(pencil)
[baíbl]	[baibúli]	(Bible)

The question is: why does the accent shift occur in some loan words? In the following paragraphs I will show that different factors are involved, namely i) the accent-shift occurs in the source language, ii) the speakers who introduced the foreign words in the receptor language were non native speakers, iii) the influence of orthography, and iv) intonation.

### 2.3.3. Accent shift in loan words.

#### 2.3.3.1. Accent shift in the source language.

In order to explain the accent shift which occurs with suffixation of some possessive and agentive markers above, I will use illustrations of a similar phenomenon found in loan words from French.



Malagasy does not have morphemes for forming names of nationality, unlike <-ish> <-ese> or <-an> in English as in 'Japanese', 'Portugese' and 'Italian'. But consider the following terms which are used in Malagasy:

Fr. [kongó] <Congo>	Mlg. [kongó]	(Congo)
[kongolé] <congolais>	[kongolé]	(Congolese)
[espáñ] <Espagne>	[espáña]	(Spain)
[españól] <espagnol>	[españól:a]	(Spanish)
[zapó] <Japon>	[zapó]	(Japan)
[zaponé] <Japonais>	[zaponé]	(Japanese)
[šin] <Chine>	[sín:a]	(China)
[šinwá] <chinois>	[sinu]	(Chinese)
[fráns] <France>	[frántsa]	(France)
[fránsé] <français>	[frantsái]	(French)
[meksík] <Mexique>	[meksíka]	(Mexico)
[mekiské] <mexicain>	[meksíkána]	(Mexican)

By looking at the Malagasy names of countries and nationalities, it cannot be said that the accent shift is a result of suffixation in Malagasy. Instead, the accent shift occurs in the source language (in this case French) and the accent pattern in the source language is transferred into the receptor language as an integral part of the word. This is further evidenced by

Fr. [almáñ] <Allemagne>	---> Mlg. [almána]	(Germany)
[almá] <allemands>	[almá]	(Germans)
[belzík] <Belgique>	[belzík]	(Belgium)
[bélz] <belge>	[bélza]	(Belgian)

where the accent pattern in the Malagasy words follow that of the original French words. Therefore, the accent pattern of the word in the source language is carried over into the receptor language but this applies to ear-borrowings only.

In the case of possessive and agentive markers above I hypothesize that originally, the accent pattern found in the affixed forms was that of the original words (in the same way as the accent pattern in the loan words from French above belong to the original French words).

In trying to reconstruct the Proto-Austronesian, Dahl (1976, p.122) compared the agentive markers ('personal pronouns') in different Austronesian languages and pointed out that "All forms of 1st and 3rd sing. are so common that they need no commentary", implying that the 1st and 3rd pers. sing. were Proto-Austronesian. This is echoed by Simon (1987) who investigated the evolution of the Malagasy language although, according to him, [-ni] is irregular in Maanyan and in the Western part of Madagascar. Simon (1987) also proposes different possible origins of the other markers: the 1st pers. plur. inclusive can be found in South Eastern Barito languages and in North Borneo; the 1st pers. plur. exclusive in North Borneo; the 2nd pers. have been subject to different changes (Simon 1987, p.102-103). From this, it can be inferred that -- apart from the 1st and 3rd pers. which were originally Proto-Austronesian -- the other possessive and agentive markers had been introduced into the Malagasy language at different stages in its evolution and

from different language sources, which would explain the difference in the accent pattern when they are affixed to stems. Therefore, the accent pattern cannot be explained by synchronic rules.

The same thing applies to the apparent exceptions in 2.3.3. above. Dahl (1951, p.90-91) explained that from the common Indonesian to Malagasy, vowels had undergone a process of assimilation ('contraction de voyelles') as in

Ind. haten >	áheng >	Mer [áina]
puun >	púun >	[fúna]
tahan >	táan >	[tána]

Also, in the common Indonesian language, the accent shifts from the initial vowel of the stem to the second one when the stem is suffixed

Ind. piaénan	---	Mer [fiainana] (life)
mipuúna		[mifúna] (to ask for mercy)
taánan		[tánana] (to be held)

so that the accent shift in the original words is not reflected in the suffixed form of the Malagasy words because of the vowel assimilation.

The accent shift in loan words from English is treated in the next section.

### 2.3.3.2. Non native speakers' pronunciation.

#### 2.3.3.2.1. Of English.

What is peculiar about some loan words from English is that accent sometimes shifts to a syllable nucleus which is absent in the English word but inserted in the Malagasy words. Consider:

Eng.	[baíbl]	--->	Mlg. [baibúli]	(Bible)
	[témpl]		[tempúli]	(temple)
	[dévɪl]		[devúli]	(devil)

Dahl (private correspondance) explains the accent shift in the latter examples as a consequence of two rules in Malagasy phonology, namely the vowel insertion between consonant clusters which are unacceptable in Malagasy and the Malagasy accent rule which allows accent to be on the ultimate or penultimate except if the word ends in [-ka], [-tra] or [-na]. Yet, the accent shift does not occur in some examples like

Eng.	[ráifl]	--->	Mlg. [réfuna]	(rifle)
	[trébl]		[turébina]	(treble)
	[ásm]		[ásma]	(asthma)
	[páls]		[pálisa]	(pulse)
	[wófɪl]		[váfila]	(waffle)
	[dzéims]		[dzémisa]	(James)

Nor does it occur in French words having final consonant clusters as in

Fr.	[latábl]	[latábatra]	(the table)
	[lítɪr]	[litatra]	(litre)

[kárt]	[káratra]	(card)
[vinégr]	[vinaíngitra]	(vinegar)

It has been claimed in 2.3.3.1. above that the accent pattern of ear-borrowings in the source language is retained in the receptor language. The examples of Mlg. [baibúli], [tempúli] and so on suggest that such was the pronunciation of those words as they were introduced in the Malagasy language.

It is generally believed that the missionaries who translated the Bible into Malagasy last century and who reduced the Malagasy language to writing with Roman letters were English (Rousselot 1913, Ferrand 1907). But what very few people know (up till now) is that the first missionaries who were involved in those works were Welsh, as indicated in sources such as Rabary (1929), Rakotovao (1985), Dahl (1966) and Munthe (1969). Referring to two missionaries who laboured in Madagascar, namely David Jones (from Neuaddllwyd, Cardiganshire) and David Griffiths (from Caermarthen), Cousins (1873, 1877) insisted upon the fact that "to these two men -- both Welshmen and both Davids -- is to be attributed the great honour of having prepared for the Malagasy people the first translation of the complete Bible" (Cousins 1877, p.247). The reason why they were believed to be English was because they spoke and taught in English, first in Toamasina (on the Eastern coast of Madagascar) and then at the royal court in Antananarivo. Their pronunciation of English is therefore likely to be

reflected in the English words which they introduced.

The phonology of Welsh English has been the object of recent studies (Thomas 1984, Awberry 1984, Williams 1986, 1989, Tench 1990). What is of interest here is the accent pattern of English words pronounced by Welsh speakers.

Accent in Welsh is on the penultimate syllable (Morris-Jones 1913, Jones 1984, Thomas 1984, Williams 1989) except in some borrowed words. Most investigators on Welsh accent agree that the unaccented ultimate syllable is more prominent than the accented syllable. The reason for the prominence of the unaccented final syllable is explained by acoustic cues. Some authors postulate the presence of a high pitch or a pitch glide in the ultima (Jones 1949, p.63; C.H. Thomas 1967, p.8, Thomas 1984, p.185), others the greater duration of the final syllable (Watkins 1953, p.9), or the greater duration of the consonant following the accented syllable (Wells 1982, Hughes and Trudgill 1987, Conolly 1981, Thomas 1984, p.185), or a combination of all these (Williams 1989). As a result, what non native Welsh speakers perceive as the accented syllable in Welsh words is in fact the acoustically prominent (unaccented) ultima (Williams 1986, p.40-41).

This prominence of the unaccented ultima is carried over into English as spoken by Welsh people (Thomas 1984, p.183; Watkins 1972, p.3; Wells 1982, p.392) and results in the unaccented final syllable being perceived by non native speakers as accented. Experiments on the perception of

accent in Welsh English by Malagasy and by English listeners confirmed this fact (see chapter 4). In addition, a vowel-like sound between two final consonants in paroxytons is perceived and is acoustically represented in formants similar to those of vowels on spectrograms.

I advance, therefore, that the accent shift from the original English words like [ba'íbl], [t'émpl] and so on is due to Welsh English pronunciation. The insertion of a vowel [-u-] results from the bilabial place of articulation of the preceding consonant which caused the vowel-like sound to be perceived as a close back vowel /u/. Welsh English pronunciation is also evidenced by segmental differences which I will not go into details here. This implies that English words like [ra'ífl] and [tr'ébl] were introduced -- orally -- by native English speakers and that others like [ba'íbl] and [t'émpl] were introduced by Welsh speakers of English.

#### 2.3.3.2.2. Of Arabic.

The same thing may apply to loan words from Arabic (which are very few compared to loan words from French or English and are more common in the North-West and in the South-East of Madagascar) introduced by non native Arabic speakers. Unfortunately, the accent pattern of the original Arabic words given as illustrations in this chapter were not indicated in the articles where they had been taken from but they are nevertheless mentioned here.

Dahle (1885) pointed out that some supposedly loan words from Swahili in Malagasy "are evidently Arabic, although they have in most cases been introduced here by traders from the Swaheli country, and therefore through the medium of the Swaheli language, as very few traders here have come direct from Arabia" (Dahle 1885, p.115). It is anticipated that the accent pattern of some Arabic words introduced by Swahili speakers into Malagasy would differ from that of Arabic words spoken by native Arabic speakers. Dahle (1885, p.115) suggested the following Arabic words as having been introduced into Malagasy through different media:

	Medium	Mlg.	
Ar.<surat>	Malay	[súratra]	(writing)
Ar.<márahaba>	Swaheli	[arahába]	(greeting)
Ar.<baraq>	Arabic	[baráka]	(honour)

Ellis (1838, p.451) reported how other borrowings from Arabic (collected by Flacourt) had been introduced first by the Arabs in the South East of Madagascar, then by speakers of South-Eastern dialects of Malagasy into the Merina dialect.

Ar.<Al-hamalu>-->SE.<Alahemali>-->	Mer.<Álahamády>	(Aries)
<Atz-tzauru>	<Azoro>	<Adaóro> (Taurus)
<Al-dsehauza'u>	<Alizoro>	<Ádizaóza> (Gemini)
<As-sahr>	<Asarata>	<Asórontány>(Cancer)
<Al-asadu>	<Alaasade>	<Álahasáty> (Leo)
<As-sumbulu>	<Asombolo>	<Ásombóla> (Virgo)



<Al-mizana>	<Alimiza>	<Ádimizána> (Libra)
<Al-aqrabu>	<Alacarabo>	<Álakarábo> (Scorpio)
<Al-qausu>	<Alacossi>	<Álakaósy> (Sagitt.)
<Al-dsehadiu>	<Alizadi>	<Ádijády> (Capric.)
<Ad-dalu>	<Adalo>	<Adálo> (Aquar.)
<Al-hutu>	<Alohotsi>	<Álohótsy> (Pisces)

The spelling of the Arabic and the Merina words, as well as the accent pattern in the latter are from Richardson (1885). In other dictionaries, for example Abinal & Malzac (1899), the initial accent in the Merina words is not found.

The introduced Arabic words corresponded to the 12 signs of the zodiac which were used in connection with divination in the South East, but applied to the names of the months in the province of Imerina. No reference was made to accent but it is not implausible to assume that the accent pattern of these words in the Merina dialect have most probably derived from the South-Eastern Malagasy speakers' pronunciation rather than from that of native Arabs. This is evidenced by the pronunciation of some consonants, as Ellis (1838, p.452) pointed out that "The change of the letter l on the coast into d, for the dialect of the interior... is extremely common, and has already been observed in the words oli, for ody; and squile, for sikidy." This segmental difference between the Merina dialect and the coastal dialects is still productive today. A study of the prosodic systems of all Malagasy dialects is desirable for further investigation on this matter.

It follows that the difference between the accent pattern of ear-borrowings and the accent pattern of the original words (in this case English and Arabic) cannot be determined by phonological rules of the receptor language because the speaker factor (native / non native) plays a role.

### 2.3.3.3. Orthography.

Another factor which causes the accent to shift from its original place is the orthography.

From the early transcripts of the Malagasy language, the spelling showed that this language did not tolerate consonant clusters (but this is questioned in contemporary Malagasy). In the Malagasy gospel of Luke (1828), biblical terms and proper names which contain consonant clusters in English, Greek or Hebrew were transcribed into Malagasy with a vowel letter inserted between consonants, namely <-i-> in 16 loan words, <-a-> in one, <-o-> in two and <-e-> in one, as in

Mlg. <Abirahama>	(Abraham)
<Kalivary>	(Calvary)
<Salimo>	(Psalm)
<Marita>	(Martha)
<Isarely>	(Israel)
<Belezobobo> / <Bilezobobo>	(Beelzebub)
<tempoly>	(temple)

During the 1870 - 1887 revision of the Bible -- known as the 'Great Revision' -- the translators resolved to

remove the vowel letter inserted in the spelling between consonants, as in <Marita> and <Ezira>, because the Malagasy readers would read those words with an accent on such vowels, <Maríta> and <Ezíra> whereas they are pronounced <Márta> and <Ezrá> (Cousins 1893, p.42). This suggests that the spelling influences the accent placement in the pronunciation.

In a list of words which constitute the data of an experiment on the judgment of accent by 37 Malagasy speakers (see chapter 3) two very common words were included, namely <piozila> (puzzle) and <kadira> (promotion). The former, <piozila>, is found in Malagasy newspapers and magazines and it is very seldom spoken but most of time seen in its written form. The latter, <kadira> is rarely written (this spelling was found in a newspaper) but very often spoken ([kádra] from Fr. [kádr] <cadre>). The penultimate syllable [-zi-] in <piozila> was assigned accent by the majority of informants. In <kadira>, the initial syllable [ka-] was the one judged as accented. Familiarity with the pronunciation of the word is, I believe, the explanation for the initial syllable of <kadira> -- and not of <piozila> -- to be accented. In other words, when the speakers of the receptor language are familiar with the pronunciation of the loan words in the source language they would accent the original syllable accordingly but when they are not familiar with the pronunciation of the word in the source language they accent a different syllable. For Malagasy

speakers, this different syllable is most of the time the penultimate, which means that when they come across a written word with an unfamiliar pronunciation, they would accent the penultimate syllable. Such cases are very common when new converts to Christianity (who do not have any background in Bible reading) read proper names in the Bible.

This brings into consideration the Malagasy rules on spelling and on accent placement. The accent rule says that accent must be on either the ultimate or the penultimate syllable and, if the word ends in <-ka>, <-tra> or <-na>, it can be placed on the antepenultimate syllable. The spelling rule says that a vowel letter must be inserted between two consonants (Bulletin de l'Academie Malgache 1977, p.26). These two rules taken together would result in <kadíra> and consequently, in a non recognition of the word by Malagasy speakers (some of the judges in that experiment could not recognise it in the written form but when the word was said to them -- after the experiment -- they immediately recognized it). Loan words spelt with two or three adjacent consonant letters like Mlg. <Belza> (Belgian), <Tiorka> (Turkish), <elektrika> (electric), <Pesta> (pest) and many others are found in Rajemisa-Raolison (1985), which is, in my opinion, a preferable alternative to the insertion of a vowel letter.

#### 2.3.3.4. Intonation.

The explanation for the accent shift in loan words given by Rakotofiringa (1978) is the constraint of Malagasy accent rule. As he put it "Un déplacement de l'accent, par rapport à sa position d'origine, peut se produire dans le mot intégré, justement pour rester dans l'un des trois types d'accentuation." (Rakotofiringa 1978, p.71). The three types of accentuation refer to the Malagasy accent patterns, i.e. accent is on the ultima, the penult or the antepenult. He gives the example of

Eng. <cartridge> ---> Mlg. [katirídzi]

Incidentally, the accent pattern given by Rakotofiringa in this word is that found in dictionaries such as Abinal & Malzac (1899) but in Richardson (1885) this word has 2 accents <kátiríjy>. See chapter 3 on this difference of accent patterns.

Dahl (private correspondance) also accounts for the different accent pattern in loan words from Arabic as resulting from the constraint of Malagasy accent rules. He provides the following examples:

Ar. <aláhadi>	--->	Mlg.<alahády>	(Sunday)
<aththálatha>		<taláta>	(Tuesday)
<alárbia>		<alarobía>	(Wednesday)
<djumáa>		<zomá>	(Friday)
<assábtí>		<asabótsy>	(Saturday)

Thus, both Rakotofiringa and Dahl are of the opinion that it is the Malagasy accent rule which forces the word initial accent in the original words (English or Arabic) to shift towards the penultimate or the ultimate syllables in the examples cited above because these are the only possible places where accent can be located in Malagasy. However, by judging from the accent pattern in Richardson (1885), the original English accent is maintained but another accent appears on one of the last three syllables of the Malagasy words, so there must be a different explanation. It should be noted that in neither case was accent placement tested experimentally. Experiments on accent perception are reported in the next chapter.

Supposing that Dahl and Rakotofiringa are right, the question is: if native Malagasy words can have an accent towards the beginning of words having four or more syllables as in examples such as [púlulútra] [tsíkiríti], [álaélu], showed in 2.2.2. above, why is it not possible to retain the accent on the initial or second syllable of English words, like [ká:tridz], or Arabic words, like <aláhadi>, having similar number of syllables? The explanation is to be found in the intonation pattern of Malagasy. As will be shown throughout this thesis it is the nuclear high tone which is on one of the last three syllables and makes it prominent.

For the time being, suffice is to say that when words are said in isolation, they are spoken with a certain

intonation pattern. Such intonation pattern is often referred to in the literature as the 'normal' intonation of isolated words, a notion which has been attacked by Schmerling (1974). Here it will be called the intonation pattern of words in citations. In Malagasy, this pattern can be described as one of the last three syllables being pronounced on a relatively higher tone than the other syllables, resulting in the 'tonic' syllable being perceived as 'accented' and the post tonic syllables as being 'unaccented'.

Using the symbol \* to indicate the 'tonic' (i.e. the syllable which has a high tone), this point is illustrated with examples, first of native Malagasy words, then of loan words.

1. a) [<sup>\*</sup>vatu] <vato> (stone)
- b) [<sup>\*</sup>vatulampi] <vatolampy> (rock)
2. a) [<sup>\*</sup>famantarana] <famantarana> (recognition)
- b) [<sup>\*</sup>famantaranandru] <famantaranandro> (watch/clock)  
(lit. tool for recognizing time)
3. a) [<sup>\*</sup>tani] <tany> (land)
- b) [<sup>\*</sup>tanindrazana] (Lit. home of ancestors=homeland)

Each of the examples a) and b) constitutes what I call an intonation group in chapter 6. When a word is said in isolation, it constitutes an intonation-group by itself.

Prominence is on the last accented syllable in an intonation group. In a) the words [vatu], [famantarana] and [tani] are said in isolation and the tonic syllable is what is traditionally considered as the accented one. In each of sentence b) [vatu], [famantarana] and [tani] are the first elements of compound words and they are no longer situated at the end of intonation-groups; therefore the tonic syllable is the last accented syllable of the second element. This is tantamount to saying that intonation determines accent in Malagasy. This will be demonstrated throughout this thesis.

This association between (primary) accent and (high) tone has already been alluded to by previous investigators but accent was then treated separately from intonation. See discussion in chapter 6.

In Malagasy pronunciation of ear-borrowings, the high tone is on the last syllable nucleus in the original words, e.g.

Eng. [ká:trɪdʒ]	--->Mlg. [katiridzi]	(cartridge)
		*
[pʊlpɪt]	[pulpitra]	(pulpit)
		*
[bɪʃp]	[besupi]	(bishop)
		*

This is further evidenced by the Malagasy pronunciation of English compound words which have become single words in Malagasy, such as the following examples found in Abinal & Malzac (1899) and Richardson (1885)



Eng. [pé'annaif]	---> Mlg. [penefu]	(pen knife)
[praí'mministə]	[pra'iministra]	(Prime Minister)
[pítʃfə:k]	[pitsiforka]	(Pitch fork)
[skru:'draivə]	[sikurudrevu]	(Screw driver)

(Accent labelling of these syllables is agreed by both Abinal & Malzac (1899) and Richardson (1885).

As a result, the rules which have so far been attributed to accent placement are in fact those of the location of the nuclear high tone in an intonation group.

If accent is determined by intonation, can the high tone occur in an unaccented (not lexically marked accented) syllable? The answer is yes. For example in abbreviations,

Ji.Ra.Ma. [dzi ra ma] (Malagasy electricity and water)

O.N.U. [o en y] (United Nations Organization)

Moreover, multisyllable words may have no tonic syllable (and therefore no accent) at all if they are not at the end of an intonation-group boundary. Consider the word <Antananarivo> in the following examples:

[antananarivu] <Antananarivo>

but [antananarivu renivu:tra] <Antananarivo renivohitra>  
(Antananarivo the capital)

#### 2.4. Summary.

Traditionally, Malagasy word accent rule assigns accent to one of the last three syllables of word. It has been claimed by some authors that when the accent in loan words is on a syllable other than the last three, it is subject to modification because of this rule. The study of some loan words has shown that such is not the case and that other factors such as the etymology, the medium, i.e. the pronunciation of the non native speakers who introduced the word into the receptor language, the influence of orthography and the intonation play a role in modifying the original accent pattern of borrowed words. On the other hand it is claimed in the present chapter that prominence of a syllable is not assigned by accent rule but due to intonation.

## CHAPTER 3

### EXPERIMENTS ON PERCEPTION OF ACCENT

This chapter contains a series of experiments on the perception of accent (at word and sentence levels) on the results of which most of the arguments in this thesis have been based.

#### 3.1. EXPERIMENT 1: Accent in Malagasy loan words.

Opinions differ on the number of accented syllables in multisyllable Malagasy words. This is reflected, for example, in two of the early Malagasy dictionaries compiled by French and by English authors, namely Abinal and Malzac (1899) and Richardson (1885) respectively. In Abinal and Malzac's dictionary, Malagasy words of 3 syllables or more have only one accent (which is on one of the last three syllables) whereas in Richardson's, the same words generally have two equal accents, the second of which corresponds to the single accent in Abinal and Malzac. For example,

A & M (1899)	Richardson (1885)	
angilísy	ángilísy / ángalísa	(English)
Baibóly	Baíbóly	(Bible)
dokotéra	dókotéra	(Doctor)
governóra	góverinóra	(governor)

Although the compilation of both dictionaries had been done with the cooperation of native speakers of Malagasy, it is not clear how much these native speakers contributed in ascertaining the word accent patterns.

An experiment was conducted by the present author in Antananarivo, the capital city of Madagascar, in August 1989, whose aim was to investigate how many accented syllables Malagasy informants perceive in multisyllabic words and, if more than one syllable is judged as accented, whether they are perceived as equal or not.

3.1.1. The material consists of 30 isolated words of 3 or more syllables which have been borrowed from French or from English (see Appendix 1). Words of foreign origins were chosen because the informants may otherwise be influenced by rules of accentuation in Mlg if native Mlg words had been used. Of the 30 words, 21 were taken from both Abinal & Malzac (1899) and Richardson (1885) (see Appendix 16 for phonetic transcription and English translations of those words). Added to the 21 words were 6

others which have been borrowed more recently: <republika> (Republic), <prezida> (president), <kominista> (communist), <televiziona> (television), <video>(video) and <sosialista> (socialist), and a proper noun <Jerosalema> (Jerusalem). Finally, two words were added to the list, namely <piozila> (puzzle) and <kadira> (promotion) for the purpose which has already been explained in the previous chapter.

3.1.2. The informants who took part in this experiment numbered 37. They were all native speakers of Malagasy dialects, male and female, aged between 25 and 40 and have not lived outside Madagascar before. Apart from 5 informants who studied Malagasy as their main subject at university and one who did not go to university, the others have done or are doing university studies in subjects other than Malagasy (Medicine, Sciences, History, Polytechnic, French, English, Mathematics and so on). For the purpose of the analysis they were divided into 3 groups. Group 1: (19) native speakers of the Merina dialect; group 2: (13) native speakers of other Malagasy dialects, and group 3: (5) linguistically trained Malagasy speakers, meaning informants who had had some formal teaching about accent during their university studies.

3.1.3. Procedure. Each informant was given a written randomized list of the 30 words on a sheet of paper. He/she wrote down his/her name, the subject studied at university,

the Mlg dialects as well as the foreign languages which he/she can speak (putting the native dialect first). The informants also answered the question -- written on the test sheet -- 'Efa nianatra momba ny tsindrimpeo ve ianao?' (have you learned about accent before?), to which they gave free responses such as 'yes', 'no', 'only a notion', 'yes but forgotten' 'yes but not in depth', 'yes but long ago' and so on. That question was asked in order to find out whether they had any notion of accent ('tsindrimpeo' in Malagasy).

The instruction -- written in Malagasy on the test sheets -- was as follows: 'mark the accent (Mlg. <tsindrimpeo>) in the following words, e.g. <mófo>. If you find two accents in one word, then double the mark on the one you judge louder / stronger (the Malagasy expression <mafy kokoa> used in the instruction can mean both), e.g. álitára or álitára. If the loudness / strength of the two accents are equal, put only one mark for each, e.g. <álitára>. The informants did not hear a tape of the words.

The task was repeated 3 times with 3 different randomized lists of the same words and on 3 different days. In this way, the informants were not given any opportunity to compare the 3 test sheets. Each informant did the tasks independently.

3.1.4. Interpretation of the data. In the first place, the degrees of accent are disregarded; that is to say, whether syllables were marked with ' (accented) or with "

(having stronger accent) they are first considered as simply accented. Degrees of accent will be considered later on (see 3.3.2. below). A syllable gets a score of one each time it is judged accented by an informant. For example, informant no.1 scored the syllables of the word <governemanta> as follows 0 2 3 1 0. This means that on the 3 test sheets of speaker no.1, the second syllable was perceived as accented twice, the third syllable 3 times, the fourth once; the first and the last syllable were not perceived as accented by speaker no.1. Then the total number of scores given to each syllable by all the speakers in each group were added up and calculated in percentage. The first row of figures under each syllable in Appendix 1 refers to the percentage of individual judgment scores obtained by each syllable.

A syllable which is assigned accent at least once and by more than 50% of informants is labelled accented (see Appendix 1). For example,

	Group 1	Group 2	Group 3
	<zaridaina>	<zaridaina>	<zaridaina>
%inform.	73 5 94 5	69 100 7	80 100

in the word <zaridaina> 2 syllables -- the first and the third -- are labelled accented (i.e. 2 syllables are assigned accent by at least 50% informants in each group).

The percentage of informants marking a syllable as

accented (% inf.) in each group and the percentage judgment scores (% sco.) are found in Appendix 1 and are represented on a multiple bar chart (Fig.1) for comparison.

The degree of agreement between informants on the accented syllables is represented with the standard deviation (SD) for each accented syllable (see Appendix 2).

3.1.5. The results are given here of three groups of speakers; 1) the 19 native speakers of the Merina dialect, source of the official language, 2) the 13 speakers of other Malagasy dialects and 3) the 5 linguistically trained Malagasy speakers. The reason for dividing the informants into such groups is to see whether non-native speakers of the Merina dialect perceive accent differently from native speakers and whether linguistically trained speakers perceive it differently from non-linguistically trained ones.

### 3.1.6. Percentage scores for accented syllables and measure of agreement.

#### 3.1.6.1. Group 1. Native speakers of Merina.

Five out of 19 did not have any notion of accent (i.e. they answered 'no' to the question 'have you learned about accent before?'). Those five were told to look for the syllable(s) which is/ are louder or stronger than the



# GOVERNEMANTA

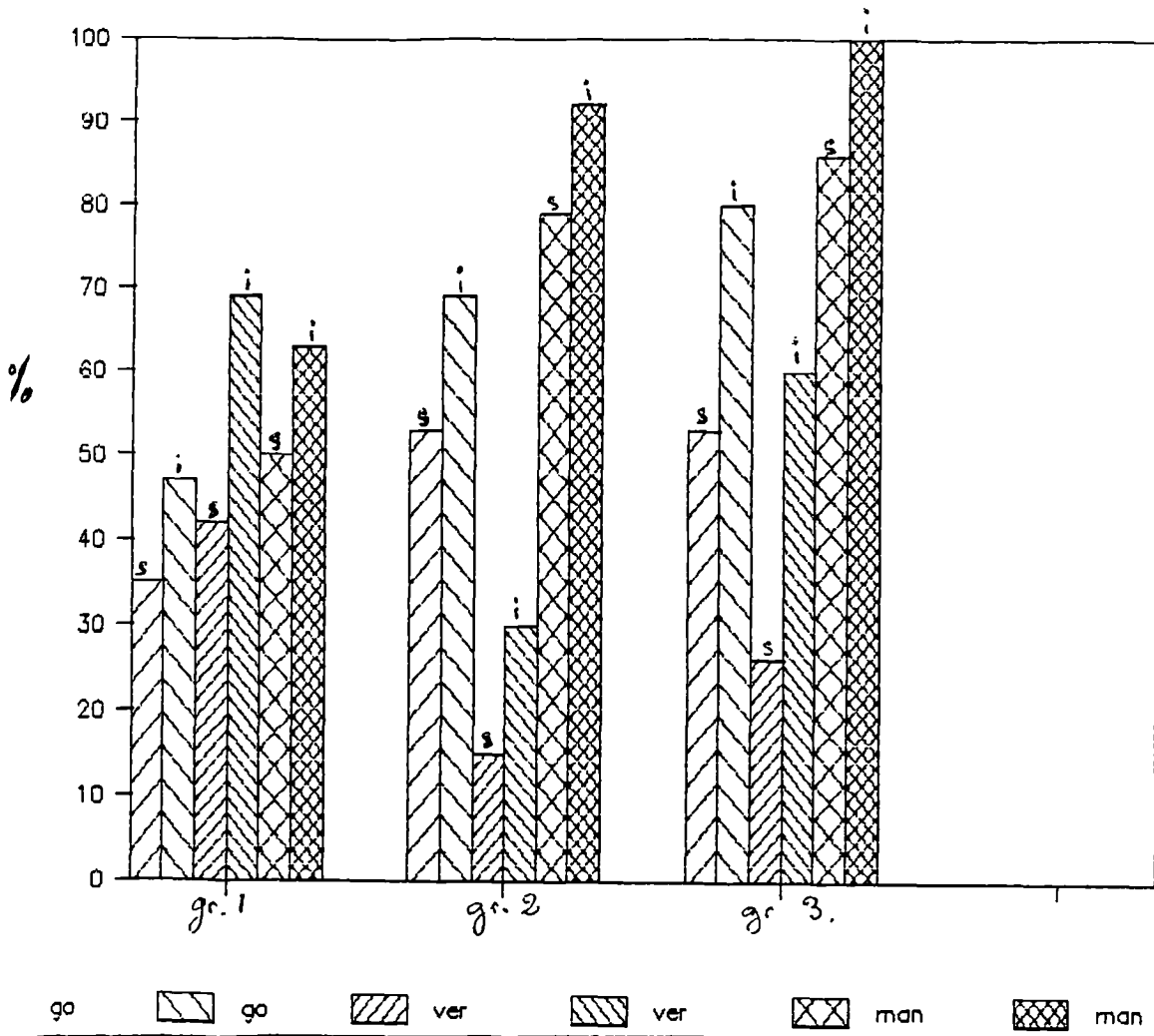


Fig.1. Multiple bar charts of percentage scores of accent judgment (%s .) and percentage informants (%i .)

others in each word.

More than 50% of the 19 informants in that group assigned accent to one syllable in <kadira>, to three syllables in <video>, <pitipoa> and <governera> and to two syllables in the remaining 26 words. Thus, the majority of the words in the data was assigned 2 accents by this first group. In addition, words like <governemanta> <piozila> <karibonetra> <kadira> and <televiziona> displayed syllables to which more than 40% (but less than 50%) informants assigned accent. See discussion below.

Where 2 syllables were assigned accent, there was generally more agreement on the rightmost accented syllable than on the leftmost one, except in <pasiporo>, <dabilio>, <krismasy>, <benjamina>, <piozila>, <Jerosalema> and <televiziona> where the agreement between informants on both accented syllables was almost the same. In words which were assigned 3 accented syllables, the degree of agreement on the three syllables were more or less equal in <video> and <pitipoa> but agreement was higher on the rightmost accented syllable in <governera>. Also, in the words having 3 accented syllables, the highest percentage agreement was smaller than in words where only two syllables were assigned accent, showing that when more than 2 syllables were judged accented there was less agreement between the informants.

### 3.1.6.2. Group 2. Speakers of other Malagasy dialects.

Thirteen took part in the experiment (Informants no.20-32). One had no notion of accent. The dialects spoken by this group of speakers are Betsileo, Vezo, Antanosy, Antandroy, Antambahoaka and Antaifasy. They all speak the official language as well.

In this group, more than 50% informants assigned accent to one syllable in one word, <kadira>, to two syllables in the majority of the words (27 words) and to three syllables in <video> and <pitipoa>. In addition to the two syllables assigned accent by 50% informants, one syllable in <televiziona> was assigned accent by 46% informants.

In the second group too, there was generally more agreement on the rightmost accented syllable than on the leftmost one except in <kominista> where the two accented syllables had equal percentage agreement. In words having 3 accented syllables, <video> and <pitipoa> the leftmost or the medial accented syllable received the highest percentage agreement which is also smaller compared to the highest percentage agreement in words having two accented syllables, as in the judgment of group 1.

A comparison between the two groups revealed that there was more agreement between the subjects in the second group (of non native speakers of Merina) than in the first group (of native speakers of Merina). For example, there was 90-100% agreement on the rightmost accented syllable in 18

words (out of 30) judged by group 2 and in 13 words judged by group 1. The reason is probably the fact that there were 5 subjects who did not have any notion on accent in group 1 as against 1 in group 2.

### 3.1.6.3. Group 3. Linguistically trained informants.

The 5 informants (Informants no.33-37) in this third group are speakers of 3 different dialects, namely Betsileo, Sakalava and Tsimihety. They also speak the official language. All of them have studied or are studying Malagasy at university as their main subject, so, all of them had studied about accent in Malagasy.

In the judgment of this third group, more than 50% informants assigned accent to one syllable in one word <kadira>, to two syllables in 26 words, and to 3 syllables in <pitipoa>, <governemanta> and <televiziona>.

In most cases, the two accented syllables received equal percentages of agreement. The number of informants being small in this group, the difference of 20% is made by only one informant, so that where percentages differ by 20% they are considered as almost equal.

This group is characterised by higher percentages of agreement compared to the other 2 groups. There was 100% agreement in the third group on 14 accented syllables, but on only 7 accented syllables in group 2 and on 2 accented syllables in group 1. This probably results from the

formal teaching on accent that the subjects in this third group have received.

As in group 1 and 2, there was also less agreement on words assigned 3 accented syllables than on words assigned 2 accented syllables.

#### 3.1.6.4. Summary.

To sum up, the 3 groups of informants assigned accent to the same 2 syllables in the majority of the words (26-27 words) in the present data.

The only word assigned 1 accent by all 3 groups was <kadira> (from French [kádr] <cadre>). This word is pronounced [kádra] -- with a consonant cluster in medial position -- but due to the Malagasy spelling rule (according to which a vowel letter must be inserted between consonants (apart from prenasalized consonants, e.g. <mb> <nd>, and affricates, <e.g. <dr> <ts>, which are written with digraphs), a letter <i> was inserted in the orthography. A total of 15 subjects in the 3 groups said they were not familiar with this word (but they did recognize the word when it was spoken to them after they had handed in the last response sheet). Of those 15 subjects, some did not assign accent to any syllable in this word while others assigned accent to one of the syllables (most of the time to the penultimate). The informants who assigned accent to the initial syllable are those who guessed the meaning of the

word (but some expressed that they had problems to identify the word in the first place). As explained in the previous chapter (2.4.3.) familiarity with the pronunciation of foreign words determines accent placement in the Malagasy borrowings, which resulted in the first syllable of <kadira> being the one judged as accented.

All three groups assigned 3 accents to <pítipóá> but the percentage agreement on the 3 syllables was lower compared with the percentage agreement in the other words. The possible reason is the presence of a vowel hiatus /uʂa/. It could be that the difficulty was to decide on which of the two vowels is accent located. When a diphthong is in accented position as in <dabilío> or in <palitáo> the difficulty does not arise. It appears that the problem here is one of syllable boundary, i.e. when faced with vowel hiatus the subjects have difficulty to decide whether the two vowels belong to the same syllable or not. This also applies to other words in the data which contain a vowel hiatus, such as <video> (which was assigned 3 accented syllables by Gr.1 and 2 but not by Gr.3) and <televiziona> which was assigned 3 accents by Gr.3; in the judgment of Gr.1 and 2 <televiziona> had 2 accents (i.e. 2 syllables on which there was at least 50% agreement) but there was 40% -- or more -- agreement on a third syllable.

In most cases, there was more agreement on the rightmost accented syllable than on the leftmost one. By comparing the three groups of informants, there was more

agreement between the (linguistically trained) informants in group 3 than between the (non linguistically trained) informants in group 1 and 2, and there was more agreement between the informants in group 2 than in group 1. It was therefore predicted that there would be greatest variation in the scores assigned by group 1.

### 3.1.7. Scores.

#### 3.1.7.1. Group 1. Native speakers of Merina.

In 23 words each of the two accented syllables attract at least 50% scores.

The rightmost accented syllable is characterised by greatest score except in <kadira> and <televiziona> where the greatest score was on the leftmost accented syllable. In 8 words, namely <video> <governemanta>, <poritera>, <polipitra>, <karibonetra>, <dokotera>, <governera>, <kominista> only the rightmost accented syllable obtains 50% scores or more but the leftmost one obtains less than 50% (but more than 40%). In addition, the 8 words above are characterised by the greatest score being smaller (generally around 50%) compared to the greatest score -- on the rightmost accented syllable -- in the other words (60-91% scores). None of the syllables in <pitipoa> attracted 50% votes, i.e. all syllables obtained less than 50% scores.

The difference of scores between the two accented syllables is clear cut except in <kaporaly>, <krismasy>, <benjamina>, <Jerosalema> where the scores for the two accented syllables are almost the same.

The results of this first group of speakers reveal that, the rightmost accented syllable obtains the greatest percentage scores in the majority of the words.

There were variations in the scores given by informants. This variation is represented here in standard deviation (Appendix 2) for each accented syllable. There is greater standard deviation (SD) on the leftmost syllable than on the rightmost accented syllable, but in <video>, <pitipoa>, <kaporaly>, <governemanta>, <dabilio>, <krismasy>, <governera>, <benjamina> <Jerosalema>, <kadira> and <televiziona> the SD on both accented syllables in each word are more or less the same.

### 3.1.7.2. Group 2. Speakers of other Malagasy dialects.

Their results show that in 23 words the two accented syllables attract 50% scores.

Only one accented syllable in the words <video>, <beritelo>, <piozila>, <dokotera>, <benjamina> <kadira> and <televiziona> obtains 50% scores but here too, a second syllable (usually the initial one) has between 40% and 48% scores, except <kadira> which initial syllable -- the only accented syllable in that word -- receives 77%.



As in the previous group the two words <kadira> and <televiziona> were the only ones to have greatest score on the leftmost accented syllable but in some cases like <pitipoa> and <dabilio>, the difference of scores between the leftmost and the rightmost accented syllables is very small.

As in the first group, there is less variation of scores (smaller SD) on the rightmost accented syllable than on the leftmost accented syllable. A small difference of SDs is observed between the three accented syllables of <video> and <pitipoa>, and between the two accented syllables of <socialista>, <piozila> and <televiziona>.

### 3.1.7.3. Group 3. Linguistically trained informants.

In this group, each of the two accented syllables in 26 words obtain at least 50% scores.

Only in <piozila> the initial syllable attracted 48% scores . The words <pitipoa> and <televiziona> were assigned three accented syllables having equal scores.

In the judgment of this group <kadira> is the only word which has highest score on the leftmost syllable.

As in the judgment of the other two groups, the highest score is smaller in words which are assigned three accents than in words assigned two accents.

Unlike in the judgment of group 1 and 2 where the highest score is on the rightmost accented syllable, in

group 3 the difference of scores between the two accented syllables being small (1 score=20%) the two accented syllables obtain similar scores in about 63% of the data, namely <pasiporo>, <kaporaly>, <karavasy>, <palitao>, <kapiteny>, <poritera>, <dabilio>, <damizana>, <prezida>, <beritelo>, <krismasy>, <dokotera>, <governera>, <kafitera>, <benjamina>, <Jerosalema> and <kominista> (in addition to <pitipoa> and <televiziona> above).

Thus, compared to group 1 and group 2, there is less variation in the scores obtained by the accented syllables in group 3, that is to say, the two accented syllables obtain more or less equal scores. As a result, the greater SD on the leftmost accented syllable which is found in the judgment of group 1 and 2 is found in fewer words in the judgment of group 3. This lesser variation probably results from the linguistic training that the informants in group 3 had received.

#### 3.1.7.4. Summary.

Considering the scores obtained by the accented syllables, the rightmost one had a higher score than the leftmost one in the majority of the words judged accented by group 1 and group 2 but in the judgment of group 3 the two accented syllables receive similar scores in the majority of the words. In addition, there is greater variation of scores on the leftmost accented syllable than on its

rightmost counterpart.

In the judgment of all three groups, the words <televiziona> and <kadira> were the only words in the present data which have the highest score on the leftmost syllable. The case of <kadira> has already been explained in 3.1.6.4. above. <Televiziona> being the longest word (in term of syllable number) in the data, another source of difficulty with this word could be its length, suggesting that the longer the word, the more difficult it is to assign accent to it. It would be interesting to investigate Malagasy speakers' accent judgment in long words -- which abound in Malagasy --, such as <fa+mantaran+andro> (a watch), <fana+tanjahan+tena> (sport), <fifanka+tia+vana> (love) and so on, which are in fact compounds but written in one word.

### 3.2. Discussion.

#### 3.2.1. Number of accented syllables per word.

As the results of this experiment reveal, Malagasy informants assign accent to two syllables in the majority of the multisyllabic Malagasy words in the present data. It may be argued that the reason why most of the words were assigned two accents instead of one is the instruction given to the informants (i.e. the instruction suggests that 2 accents are likely to be found in some words). Putting

this in another way, if the informants were asked to locate one accented syllable in each word, they would have found only one. But even so, the results would have been biased. The reason for giving the informants the possibility to accent two syllables in the instruction was because in a preliminary experiment, some Malagasy informants had located two accented syllables in some words although the present investigator had expected only one. Hence the reason for giving that instruction. Furthermore, most of the informants in this experiment marked one accented syllable in some words and two accents in others. Only 5 informants out of 37 found 2 accented syllables in all the words and 2 informants found even 3 accented syllables in certain words. Therefore, this argument is rejected.

What should be said about syllables to which less than 50% (but more than 40%) informants assigned accent? Such syllables are found mainly in the judgment of 5 words by group 1. The 5 words are <governemanta>, <piozila>, <karibonetra>, <kadira> and <televiziona>. The explanation for <kadira> is the fact that the majority of the informants who said that they were not familiar with this word assigned accent to the penultimate syllable. The problem with vowel hiatus found in <pitipoa> in 3.1.6.4. above may explain the case of <piozila>. As for <governemanta>, <karibonetra> and <televiziona> the explanation may be in the length of these words (in term of syllable number), these 3 words being among the longest words (5-6 syllables) in the data. That

such scores were found in the judgment of these words by group 1 but not by group 2 nor group 3 shows that disagreement between informants was greatest in group 1.

As was mentioned in the previous chapter, Malagasy authors agree on the existence of two accents in multisyllable native Malagasy words although they disagree on their nature, i.e. some authors consider the rightmost one as primary and the other as secondary, whereas others consider them to be equal. It is therefore plausible to assume that the same accent patterns assigned to the loan words in the experiment above would also apply to native Malagasy multisyllabic words.

### 3.2.2. Degrees of accent.

In the instruction given to the informants who took part in this experiment, they were asked to mark stronger accent with double quotation mark (") above the syllable if they perceived one accent as stronger than another.

Some informants marked some syllables as more strongly accented in some of the words but not in all. In addition, very few of those who did so marked the same syllable with stronger accent on the 3 response sheets; for example, Subject 6 marked the first syllable of <krismasy> with " in one of her response sheets but on another sheet it was the second syllable of that word which was marked as having a stronger accent. Thus, the subjects (even the

linguistically trained ones) were not consistent in their assignment of a stronger accent as most of them were in accent assignment. Therefore, it was difficult to give scores in percentage as in the previous results and the scores given in Appendix 3 represent the number of times (and not the percentage scores) that a syllable was judged as more accented than another syllable of the same word in the judgment of all 37 informants and in the 3 randomized orders (this means that if all the informants had marked one syllable in every word as having a stronger accent on the 3 response sheets, the total score of the stronger syllable should be 111, but the highest score here (27) is much fewer than that). Here too, the scores indicate that the rightmost accented syllable was judged as having a stronger accent more often than the leftmost one, except -- once more -- in <video>, <kadira> and <televiziona>. However, the proportion of scores is too small for the rightmost accent to be considered as 'primary' and the leftmost one as 'secondary'.

3.2.3. The conclusion that can be drawn from the results of this experiment is that Malagasy speakers perceive two accented syllables in multisyllabic loan words. There is more agreement on some accented syllables (generally the rightmost ones) than on others. The native dialect does not seem to affect the perception of accent by speakers of the official language since the 3 groups of

speakers find the same accent patterns in most of the words. The effect of linguistic training on accent assignment is more agreement between informants.

The results of this experiment confirm the accent pattern of multisyllable Malagasy words as in Richardson (1885), that is, multisyllable words have two accents instead of one as in Abinal and Malzac (1899).

A further question is: is this prominence of the two accented syllables due to the word being in isolation? Putting it in another way, if those words were not in isolation but within sentences, would the two accented syllables still be perceived as such? This question will be answered in experiment 3 below.

### 3.3. Sentence accent.

At sentence level, syllables are said to have relative prominence and the most prominent syllable is often referred to in the literature as 'sentence stress', 'sentence accent', 'sentential stress', 'primary accent', 'nuclear syllable', 'tonic syllable' and so on.

Previous studies suggest that there is one sentence accent in languages like English (Prince 1983, Selkirk 1984) and German. Some languages, for example Southern Swedish and Standard Danish, have recently been reported to lack a sentence accent (Thorsen 1983, p.29, 31). For the case of Standard Danish, Thorsen (1983, p.29) stated that "in

pragmatically and emotionally neutral speech (as, for instance in the reading of context-free utterances) NONE [emphasis is hers] of the stressed syllables is more prominent than the others." Other languages, such as Dutch ('t Hart and Collier 1979) and Malagasy (Dahl 1952, Rafitoson 1980) are reported to have more than one sentence accent. According to the latter two authors cited above, Malagasy sentences have at least two primary accents, one primary accent being assigned to the last lexical accent in at the boundary of the syntactic function called Subject and the other to the last lexical accent of the Predicate (this is discussed in detail in chapter 5).

Two experiments (Exp.2 and Exp.3) were conducted by the present author in order to test this claim. The data used in the experiments below and the informants who took part in them were different from the data and the informants in experiment 1 above. Experiment 3 was also aimed at answering the question posed in the section on word accent above: are accented syllables of words in isolation perceived as such when the words are put in sentences?

The term 'accent' is used in this chapter to refer to syllables which are judged prominent by a majority of informants (more than 50%) at sentence level and word accent is referred to as lexical accent (i.e. it is the syllable which has accent when the word is in isolation).



### 3.3.1. EXPERIMENT 2: Discrimination between pairs of sentences.

The aim of this experiment was to investigate whether minimal pairs of sentences are perceived by listeners as different in meaning and if so, whether they perceive the semantic difference as due to different accent loci.

#### 3.3.1.1. Material:

Six pairs of sentences were prepared (see Appendix 4); the sentences in each pair are segmentally identical (see Appendix 5) but the meanings are different, reflected in the hypothesized different accent placement. The pairs of sentences are all spoken by 4 native speakers of the Merina dialect and the two sentences of each pair are spoken by the same speaker. The speakers are 2 female (referred to as speakers A and B) and 2 male (speakers C and D).

The sentences have two different orders of syntactic constituents: Predicate-Subject (pair no.1,2,3), and Subject-Predicate (pair no.4,5,6a). Sentence 6b is a predicate on its own (i.e. without a subject). In sentence a) of each pair, the nuclei of the predicted accented syllables are the same vowels so that difference in accent may not be attributed to difference in vowel quality, and they are preceded by identical consonants whenever possible. Each Malagasy vowel (except /i/ because of failure to find

segmentally identical pairs of sentences) appears in the expected accented position in those sentences. /ai/ is the only diphthong present in the data. Pair no.2a and 3a have been constructed on the model of two examples from Rafitoson (1980) in order to test her claims. They have been slightly altered in order to conform to the criterion about vowel quality mentioned above and, in addition, to form complete sentences. The English translations of those sentences are in Appendix 4.

The recording was accomplished at the sound-proof recording studio of the Lutheran Communication Center (formerly known as the Radio Voice of the Gospel) at Antsirabe, Madagascar, in July 1989, with an Ampex machine (full track) and a AKG D140 microphone which was positioned at about 30 centimeters from the speaker's mouth.

In order not to influence the speakers with the written form of the Malagasy sentences, written French sentences were given for them to translate orally into Malagasy and the Malagasy translations were recorded (problems about translation are explained below). The French sentences were given 30 minutes prior to the recording to allow the speakers to practice and the researcher to check whether the translations corresponded to the expected sentences.

One of the French sentences in each target pair -- together with distractors -- was first given on a sheet of paper (see Appendix 6 A) to be translated into Malagasy and recorded 3 times and in 3 different random orders for each

speaker. The second sentences (see Appendix 6 B) were also recorded in the same way but on a different day so that the speakers did not say any sentences of a pair one after the other. One token of each sentence was then selected by the investigator, paired with another sentence and played to the listeners.

The 6 target-pairs were mixed with 8 distractors which were pairs of identical sentences (see Appendix 7). There were altogether 14 pairs of sentences. The target-pairs (P) were spoken by different speakers and dubbed onto cassettes in 4 different sets as follows:

		Set 1	Set 2	Set 3	Set 4
P1	from speaker	A	C	D	A
P2		B	D	A	B
P3		C	A	B	C
P4		A	D	A	B
P5		B	C	D	B
P6		C	A	B	C

Each group of listeners listened to one set, that is to say Group 1 listened to Set 1, Group 2 to Set 2, Group 3 to Set 3 and Group 4 to Set 4. Each group listened to 3 different speakers.

### 3.3.1.2. Judges.

The judges were 24 adult native speakers of the Merina dialect, 10 male and 14 female, aged between 25 and 40. They have done or are doing university studies in different subjects (French, Sciences, Medicine, English, Polytechnic, History, Accountancy, Spanish and Malagasy). All of them speak Merina in their homes and have not lived outside Madagascar before the time of the experiment. They have mostly lived in the province of Antananarivo, although some had lived in another province to do their national service (for 1 or 2 years), or to study at a university (for 3-6 years). Three had lived in another province for 10 years or more for family reasons but spoke Merina at home and did not speak the local dialect fluently.

Each group contains a mixture of male and female listeners who studied languages as their main subjects (French, Malagasy, English or Spanish) and listeners who studied subjects other than languages. Those who studied languages had some degree of formal teaching on accent and are referred to as 'linguistically trained' informants.

None of the informants was reported to have any hearing problem.

### 3.3.1.3. Procedure.

Each listener was given a response sheet on which the pair numbers (1 to 14) -- and not the orthographic sentences -- had been written. The informants were asked to listen to whether the two sentences in each pair had different meanings or not. The listeners were to mark X on the response sheet by the number of the pairs in which the two sentences were semantically different. The task was repeated 4 times with 4 different orders on 4 different test-sheets for each listener.

After listening to the 4th randomization, each listener was asked to tell the difference(s) in the speaker's pronunciation (not their own) between the sentences in the pairs that he/she had marked with X. The answers were given orally by the listeners and written down by the investigator.

Most listeners did the task independently except in 3 cases when 2 listeners at a time did it because of failure to find any other suitable time. In such cases the two informants turned their backs to each other while performing the task.

The purpose of the experiment had not been revealed to the informants beforehand.

Each pair was scored 1 each time its sentences were judged as different by an informant. So, if all the 24 listeners perceived a difference in the 4 tokens of each

pair, the maximum score that a pair could get was  $4 \times 24 = 96$  (100%).

#### 3.3.1.4. Problems of translation.

The speakers were told that the French sentences were not always correct but were constructed for the purpose of the experiment. For example, 'marié à un docteur' (married to a doctor) instead of 'marié à une doctoresse' (married to a lady doctor), 'la soeur de mon père' (my father's sister) instead of 'ma tante' (my aunt) and so on.

As for the vocabulary, whenever the Malagasy word given by the speakers was not the expected one, they were asked to find synonyms; e.g. Fr.'envoyé':Mlg.'nirahina' / 'nalefa'; Fr.'de bonne heure':Mlg.'vao maraina' / 'aloha', and so on. One word, 'izay' in pair no.6, was suggested by the investigator instead of 'sady'.

One sentence (5b) had to be put into a context before the expected translation could be obtained. The following context was given (in French): "I saw two men yesterday, one was a doctor, the other a teacher. The doctor is a French man who was trained in France and the teacher a Malagasy who has just done his training at Ankatso".

### 3.3.1.5. Problems in judgment of accent.

It was anticipated that some listeners would refer to the differences as ones of 'intonation' or 'tone' or 'accent' or 'loudness' or 'voice', as it was the case in a preliminary experiment. (It has to be born in mind that the terminology used by the listeners does not necessarily refer to the linguistic concept). However, as long as they pointed to the syllables / words where the differences were, the problem of terminology was not considered as relevant.

Dependence of perception on the judge's own production of the sentences was also anticipated, that is to say the listener would refer what he/she hears to how he/she would say it. For example, a listener said that the difference between the 2 sentences in pair no.1 is the pause after 'manambady' in 1b (the spectrogram of that sentence shows that there is no pause after that word). In such cases, the sentence was played over and over again and the listener was asked to pay attention to whether there is a pause or not, or he was asked to say the same sentence without pausing. Whenever the listeners could not find a term to characterise the difference, they were asked to point to the syllables -- or to the words if they could not pinpoint the exact syllable -- where the difference was.

Another common problem in experiments on perception is the dependence on orthography. Although the informants were not exposed to any graphic representation of the stimuli,

some informants said, for example, that [nsakaf] is spelt <ny sakafo> -- i.e. in two words -- in 2a but <nisakafo> - - in one word -- in 2b. In such cases, the informants were told to concentrate on the pronunciation and to forget about the spelling.

Nevertheless, these problems were only brought to a minimum but not completely solved.

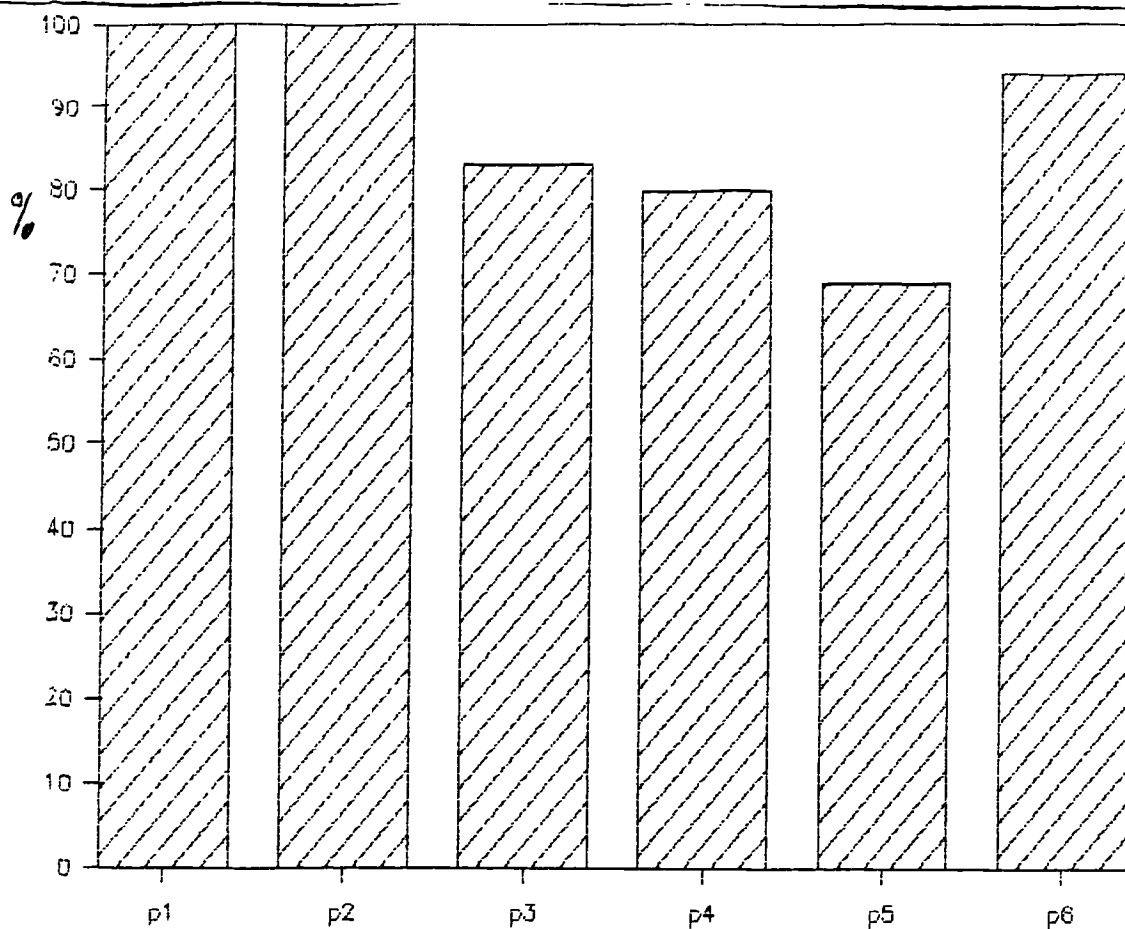
### 3.3.1.6. Results.

The results reveal that a large majority of listeners were successful in perceiving the two sentences in P1, P2, P3, P4 and P6 as being semantically different, and were mostly consistent in the 4 randomizations but less so with P5. The total scores were 100% for P1 and P2, 83% for P3, 80% for P4, 69% for P5 and 94% for P6 (Fig.2). The scores for P5 is due to the fact that some listeners failed to distinguish the difference between 5a and 5b. As explained above, sentence 5b was obtained only after being put in a context (the context was given to the speakers but not to the listeners). It means that without the context, these two sentences (5a and 5b) were perceived as the same in many cases.

The differences in the target-pairs were found by the listeners to be in intonation, accent (in French 'accent', in Mlg. 'tsindrimpeo'), tone (Fr.'ton'), juncture (Mlg. 'fitambaran'ny teny' = lit.word grouping), pronunciation



Fig.2. Percentage scores of perceived difference between pairs of sentence.



(Mlg. 'fomba filaza'), speech rate (Fr. 'vitesse'), rhythm, certain syllables being more accented (Mlg. 'voatsindry kokoa') or louder / stronger (Mlg. 'mafy kokoa') or longer (Mlg. 'lava kokoa'), or having a 'rising accent' or 'rising intonation' or simply 'rising' (Mlg. 'miakatra').

Since most of the listeners perceived differences in the pairs of sentences, and since most of them attributed those differences to relative prominence, as the terms above show, another experiment was conducted in which they were asked to identify the sentence accents.

### 3.3.2. EXPERIMENT 3. Perception of sentence accent.

A third experiment was conducted in continuation of the previous one at the same place (in Antananarivo) and with the same material and the same informants. The aim was to test the claim that there is one primary accent on the last lexical accent of each syntactic constituent (i.e. Subject and Predicate). It was also expected that the tone / intonation / rhythmic differences in Exp. 2 would coincide with accent. Nevertheless, the accent judgment in the remainder of this thesis will be based on the results of Exp. 3 for three reasons: a) the judgment of accent in Exp. 2 was done only once, i.e. at the end of the 4th listening task, whereas in Exp. 3 each sentence was judged 4 times in 4 randomized subsets; b) the focus of attention was on the difference in Exp. 2 but on accent in Exp. 3 and c)

the sentences were listened to individually in Exp. 3.

The term for relative prominence used by the investigator was the same term that each listener used in the first part (i.e. 'longer', 'louder' / 'stronger', or 'accented') ; for example, if a listener used 'louder' / 'stronger' in Exp. 2, the experimenter asked him/her to identify the syllable which is 'louder' / 'stronger' in each sentence in Exp. 3, and so on. One informant who was not familiar with the notion of accent was asked to look for the syllable(s) which stand(s) out (MLg. 'misongadina').

#### 3.3.2.1. Material.

The same 12 sentences in the 6 target-pairs in the previous experiment (without any distractor) were rearranged differently on cassettes. This time the sentences were not considered in pairs but taken individually. The first sentences of the 6 pairs were dubbed in 4 random orders (subsets i, ii, iii, iv) and so were the second sentences (subsets v, vi, vii, viii) (see Appendix 8). There were 8 subsets, each subset containing 6 test sentences (a, b, c, d, e and f). They were presented to the listeners in the following order i, ii, v, iii, vi, vii, iv, viii. That is, each subject listened to 4 identical repetitions of the 12 sentences.

### 3.3.2.2. Informants.

The same informants as in experiment 2 took part in the present one. They are referred to as L1 (Listener no.1), L2....L24. They were divided into 4 groups (group 1-4) which were the same groups as in experiment 2 above. Each group listened to the sentences (S) spoken by 3 speakers

	Gr.1	Gr. 2	Gr. 3	Gr. 4
S 1a & 1b from speaker	A	C	D	A
S 2a & 2b	B	D	A	B
S 3a & 3b	C	A	B	C
S 4a & 4b	A	D	A	B
S 5a & 5b	B	C	D	B
S 6a & 6b	C	A	B	C

### 3.3.2.3. Procedure.

The informants were told to focus on 'tsindrimpeo' (accent) only and not on the other differences they mentioned in experiment 2. They were given 8 response sheets (one at a time) as they listened to the 8 subsets of 6 single sentences but the sentences had not been written on the response sheets. Instructions were given to listen to the sentences and to identify the accented syllable(s) in

each sentence (if there was any), to write down the word(s) where the accented syllable(s) was/were and to indicate the latter with an accent mark (') above the syllable(s). The listeners were told that they were allowed to assign any number of accents (0, 1, 2, 3, 4, 5, or more) within each sentence and they were free to listen to the sentences as often as they wished before making their decisions. Since they dealt with a set at a time and were given a test-sheet at a time, they did not have any opportunity to compare any response-sheets.

It was expected that the listeners would assign accent to a number of syllables in each sentence and it was the present investigator's intention to first let the listeners assign accent to as many syllables as they wished in each sentence, then to ask them to indicate the most prominent of those accented syllables. However, since most of the first listeners found sometimes one and sometimes two accented syllables in several sentences, the task of marking the most accented was left out because it became irrelevant and that greater prominence will be assigned on the basis of the scores.

The two experiments (Exp.2 and 3) lasted for a total of  $2\frac{1}{2}$  - 3 hours for each listener, including the conversation with the present investigator at the end of experiment 2 about the differences between sentences in pairs.

### 3.3.2.4. Analysis.

1 is added to the score of a syllable each time it is picked as accented by an informant. For example, L20 (Listener no.20) judged sentence 1a (spoken by A) on 4 identical tokens as follows:

	1a. [manambaddukteraratef]				(spoken by A)		
1st token				1			
2nd token		1		1		1	
3rd token		1		1		1	
4th token				1		1	
<hr/>							
Total	0	0	2	0	4	0	0
					3		

(Only syllables which were phonetically present were taken into consideration for the purpose of acoustic measurements in the next chapter).

Syllables which were never chosen by the listeners were marked 0. The scores given by L20 to the syllables of that sentence are:

	1a. [manambaddukteraratef]						
L20	0	0	2	0	4	0	0
					3		

The figures under the syllables refer to the number of times in the 4 repetitions that each syllable was judged

accented by L20.

The accent judgments of the 6 listeners of each group over the 4 tokens of each sentence were added up, divided by the maximum score (4 x 6=24) and reduced into percentages as in the following example:

e.g.	Group 3					
	1a.	[manambaddukteraratef]				(spoken by D)
L13	0	0	0	0	3	0 0 4
L14	0	0	1	0	3	0 0 1
L15	1	0	2	2	1	0 0 0
L16	0	0	0	0	4	0 0 0
L17	0	0	0	0	4	0 0 0
L18	0	0	0	0	1	0 0 4
<hr/>						
Total	1	3	2	16	9	
%	4	12	8	66	37	

The total percentage judgment scores for each sentence by each group are found in Appendix 9.

Sentence accent in this experiment is based on two criteria: a) syllables receiving highest percentage scores (see Appendix 9) and b) syllables judged accented -- at least once -- by more than 50% listeners (see Appendix 10). In that way, both variations within listeners and between listeners were taken into account. To take one

example, the average % scores given by informants to the syllables of sentence 6b are:

Groups	Sentence 6b.								Speakers.	
	[sa kaf tsu tra ze mu ra ndra un ]									
Gr.1	0	0	75	0	4	4	0	0	0	C
Gr.2	0	12	62	0	4	21	0	4	8	A
Gr.3	4	25	50	0	4	4	8	0	37	B
Gr.4	0	4	37	0	0	16	0	4	29	C
<hr/>										
Av.% scores	1	10	56	0	3	11	2	2	18.5	

Thus, in 6b, the third syllable obtains a majority of the votes. As for the informants who assigned accent to the syllables, the averages are,

Groups	Sentence 6b.								Speakers.	
	[sa kaf tsu tra ze mu ra ndra un ]									
Gr.1	0	0	100	0	16	16	0	0	0	C
Gr.2	0	16	66	0	16	33	0	16	33	A
Gr.3	16	33	66	0	16	16	16	0	50	B
Gr.4	16	0	50	0	0	16	16	16	50	C
<hr/>										
Av.% inf.	20	12	70.5	0	12	20	8	8	33	



The accented syllable in 6b is [tsu] because it is assigned accent by more than 50% informants and receives a majority of scores.

### 3.3.2.5. Results.

Each sentence having 4 tokens (i.e. 4 identical repetitions), there were  $4 \times 12 = 48$  tokens judged by 24 listeners. There was a total of  $48 \times 24 = 1152$  tokens. Listeners assigned accent to zero, one, two, three, or four syllables in each token (see Appendix 11). A large number of tokens (672) were assigned only one accented syllable (per token); 204 tokens were assigned no accent and 221 tokens were assigned 2 accent loci. Very few tokens were assigned 3, 4 or 5 accent loci. Nevertheless, the same sentence is sometimes assigned a different number of accent loci (for example, 0 in the first token, 2 in the second, 1 in the third and the fourth) by the same listener, showing that listeners were not consistent in accent assignment (see 3.3.2.7.1. below).

The expectation that what listeners called a difference in tone, pause, intonation and so on in experiment 2 coincided with accent in experiment 3 was confirmed.

The scores obtained by the syllables of the 4 tokens of each sentence were then added up (see Appendix 9). In 8 sentences out of 12, the majority of the votes was obtained by one syllable per sentence (see Appendix 10). The other 4

sentences (namely 3a, 4a, 4b and 5b) showed some discrepancies which will be discussed below. For the time being, the focus is on the 8 sentences (1a, 1b, 2a, 2b, 3b, 5a, 6a and 6b) in which only one syllable per sentence was judged accented, i.e. received a clear majority of votes and judged by at least 50% listeners.

#### 3.3.2.5.1. One accented syllable per sentence.

The scores given by the groups to the accented syllables exhibit considerable variations. To take two examples, the syllable [-te-] of [duktera] in 1a was given 58% scores by Gr.1, 54% by Gr.2, 66% by Gr.3 and 66% by Gr.4; thus the difference of scores assigned by the 4 groups is small. The syllable [-mba-] of [manambad] in 1b was assigned 58 % scores by Gr.1, 62% by Gr.2, 83% by Gr.3 and 83% by Gr.4., showing a big difference between Gr.1 and 2 on one hand and Gr.3 and 4 on the other. Since each group listened to different speakers, this suggests that there is a difference in the speakers' realizations of this sentence. However, Gr.1 and Gr.4 listened to two different tokens of this sentence by one speaker (A), suggesting that the difference of scores may arise from a difference between the two groups. The two hypotheses, that difference in scores is due to a difference between speakers or between groups, were tested (see 3.3.2.6. and 3.3.2.7. below).

Now I turn to the 4 sentences which exhibit greatest

disagreement on accented syllables, namely 3a, 4a, 4b and 5b (see Appendix 10).

### 3.3.2.5.2. More than one accented syllable per sentence

Due to an error in dubbing, sentence 4b was played to Gr.2 instead of 4a (i.e. Gr.2 listened to 4b twice), hence the missing values.

These 4 sentences have more than one accent locus, resulting in a spread of the scores over two or three different syllables. This spreading of the scores over two or three syllables in each case reveals uncertainty from the part of listeners regarding their prominence. As a general tendency, the rightmost of the syllables judged accented obtains the highest score.

It can be observed that, apart from the 3 scores for [-lu-] in 3a and one score in 4b, all the highest scores in the 4 sentences above are around 50% or less. This is similar to the results obtained in experiments on English tonic identification (Brown et al 1980, p.145).

Sentence 4b is the same as sentence 3a with a reversed order of the syntactic constituents (the verb <nalefa> (was sent) followed by the adverbial <aloha> (first), [nalefalulu] <nalefa aloha>, is in sentence initial position in 3a but in final position in 4b). When the word [alulu] which is in medial position in 3a is in final position in 4b, the mean scores of the syllable [-lu] decreases from 61.25% in 3a to

36% in 4b and, in addition, [-le-] in [nalefa] is judged accented only by Gr.2 and 4 when it is towards the end of the sentence in 4b, suggesting that the position in the sentence influences accent judgment. This also applies to the first syllable of [leva] which is not judged accented in final position in 3a but is judged accented when in medial position in 4a and 4b.

Sentences 4a and 4b were the only ones in the present data where syllables in final position were judged accented. The reason is probably the difficulty in clearly distinguishing between the sequences [nalefalu] (in 4a) from [nalefalʊ] (in 4b) when they are in final position. When they are in initial position (as in 3a and 3b) the difference is clear -- as the scores show. In other words, the difference between the two sequences is not clear when they are in final position, resulting in a confusion of the two sentences.

The scores of accented syllables are lowest in 5b (average 25%) compared to the scores in the other sentences and so is the inter-judge agreement (45.5%). During experiment 2, some listeners expressed the difference between 5a and 5b as being in the presence of a tone or a pause or a accent in 5a but 5b being 'continuous' or 'uninterrupted' (i.e. without a accent, pause or tone). This would explain why a large number of them did not judge any syllable as accented in 5b. On the other hand, since it was found in experiment 2 that some listeners failed to

distinguish any (semantic) difference between 5a and 5b, it was expected that they would hear 5a and 5b as identical and therefore they were expected to assign accent to the same syllables in these two sentences. This may explain the assignment of accent on [-ga-]) in 5b in the judgment of Gr.3 and 4.

#### 3.3.2.6. Difference between speakers.

A one-way analysis of variance for independent samples (Cohen and Holliday, 1982, p.257) was computed with Minitab for examining the differences between speakers in average % scores for accented syllables. The scores were for each speaker (A, B, C, D) over the 8 sentences. The null hypothesis is that the difference in scores is not due to the speakers. The result of the analysis of variance (Table 1) shows that  $F=2.56$  is not significant at the .05 level. Therefore, the null hypothesis is accepted and the conclusion is that there is no significant difference among the speakers. So, the difference in the scores is not due to a real difference between the speakers.

Table 1. Analysis of variance on difference between speakers in % scores.

Source of variation	Sum of squares	d.f	Variance	F	p
Between speakers	1104	3	368	2.56	0.080
within speaker	3305	23	144		
Total	4409	26			

3.3.2.7. Difference between groups.

The other possibility -- difference between the groups of listeners -- is then examined. This is done in two ways, first by looking at the measure of consistency within each listener (which I call intra-judge consistency), then at the measure of agreement between listeners (inter-judge agreement).

### 3.3.2.7.1. Intra-judge consistency.

If a listener picked a syllable as accented at least 3 times over the 4 repetitions of the same sentence, he can be regarded as consistent in his accent judgment of that particular syllable. Informants were consistent in their accent judgment of certain syllables but not of others.

The intra-judge consistency was measured by dividing the number of syllables that each listener consistently judged as accented (i.e. 3 or 4 times) by the number of syllables he / she judged as accented (at least once). For instance, L12 judged 15 syllables as accented -- over the 12 sentences -- but was consistent in only 12 of them (i.e. the other 3 were judged accented only once or twice over the four repetitions). Thus, his consistency is  $12/15=80\%$ . The intra-judge consistency varies from 7% for L10 (i.e. that listener was consistent in assigning accent to only one syllable) to 100% for L21 (that is, L21 assigned accent 3 or 4 times to every syllable he judged accented). See Appendix 12.

Eleven out of the 24 informants had an intra-judge consistency of 50% or more. It was hypothesized that a factor which may relate to their consistency in accent judgment is their linguistic training, i.e. whether they had formal teaching about accent as part of their studies (e.g. for those who studied languages as their main subject) or not. The point biserial correlation coefficient (Cohen

and Holliday, 1982, p.163ff) was used in order to test this hypothesis. The null hypothesis was that informants' consistency is not related to linguistic training, that is to say to their formal learning on accent. The point biserial coefficient ( $r_{pb}$ ) is given the formula:

$$r_{pb} = \frac{M_p - M_q}{SD_x} \sqrt{pq}$$

where

$M_p$  = the mean score of ling. trained listeners (61.2)

$M_q$  = the mean score of non ling. trained listeners (42.2)

$SD_x$  = the stand. dev. of the intra-judge consistency (23.93)

$p$  = the proportion of ling. trained listeners (0.37)

$q$  = the proportion of non ling. trained listeners.(0.62)

The point biserial correlation coefficient ( $r_{pb}$ )=.379 describes a relatively modest correlation between listeners' consistency and their linguistic knowledge. Its significance is tested using the t formula (Cohen and Holliday, 1982, p.164). The obtained value ( $t=2.058$ ) is close to the table value (2.074) at  $N-2=22$  degrees of freedom (p.325) at the 5% level. Therefore, the null hypothesis is rejected and the conclusion which can be drawn is that consistency in accent judgment is related to informants' linguistic training.

The implication is that linguistically trained



listeners had the tendency to be more consistent in accent judgment than non linguistically trained listeners (see Appendix 12). This explains the relatively high score found on the final syllable of each sentence in the judgment of Gr.3. That group contained 3 linguistically trained listeners, 2 of whom were post graduate students in French and their formal knowledge on accent was reflected by the ease with which they assigned accent while performing the task. Linguistic training was also reflected by the fact that most of the listeners who assigned at least 2 accent loci to each token (see Appendix 11) were among those who had had formal teaching on accent (the second accent locus being most of the time on the sentence final syllable). However, this is only a general tendency because some linguistically trained listeners were less consistent than others who did not have any linguistic training.

Each group contains listeners having various percentages of intra-judge consistency. The average was lowest in Gr.1 (45%) and highest in Gr.4 (53.6%). The difference between the groups' average percentages was tested using a one-way analysis of variance (Cohen and Holliday 1982, p257). The result reveals that the difference between the groups is not significant (Table 2).

Table 2. Analysis of variance of difference  
between groups in intra-judge consistency

Source of variation	Sum of squares	d.f	Variance	F	p
Between groups	273	3	91	0.14	0.93
within groups	12902	20	645		
Total	13175	23			

### 3.3.2.7.2. Inter-judge agreement.

The amount of agreement between the 6 listeners in each group over the accented syllables is quantified by the number (reduced into percentage) of listeners who assigned accent (at least once) to the syllable having the highest score (see Appendix 10). For example, in sentence 2a, the syllable [-lai-] was judged accented by 3 out of the 6 listeners (50%) in Group 4, and by all 6 listeners in Group 3 (100%). The degree of agreement between informants on that particular syllable is 50% in Group 4 and 100% in Group 3. The average inter-judge agreement -- across the 4 groups

-- on the accented syllable in each of the 8 sentences is between 70.5% and 90.75%.

It is worth comparing the degree of agreement between Malagasy speakers and between speakers of other languages. Watanabe (1988) described an experiment on accent perception -- in 25 English sentences -- by Japanese and (Australian) English speakers (the latter numbered 27). The data of Watanabe's experiment were short sentences (comprising one intonation unit) having only one syllable carrying one type of nuclear tone per sentence (i.e. falling, rising, rising-falling and falling-rising). The degree of agreement between the English speakers on accented syllables was between 85% and 100% (Watanabe 1988, p.184). Also, in pilot experiments conducted by Brown et al (1980), 29 British and American listeners (including professional phoneticians and postgraduate students in phonetics) were asked to identify the 'tonic' syllables of sentences spoken in Edinburgh Scottish English (ESE). Their results revealed that "in thirteen out of the twenty sentences at least 75 per cent of judges agreed in the identification of at least one tonic. In the remaining seven sentences at least 50 per cent of judges agreed on at least one tonic ....but in this second set there was a considerable spread of choice." (Brown et al 1980, p.145). By comparing the measure of agreement between listeners, the inter-judge agreement between Malagasy listeners is similar to the degree of agreement between English ones.

Thus, the variations of scores obtained by accented syllables in this experiment are mainly due to the listeners' inconsistency in accent assignment. Consistency generally results from formal teaching on accent.

#### 3.3.2.8. Summary.

To sum up, the results of these experiments on the judgment of accent at sentence level reveal that in 8 out of 12 sentences spoken by 4 speakers only one syllable per sentence is judged as accented by the majority of informants. The average percentage of listeners who assigned accent to such a syllable in those 8 sentences is between 70.5% and 95.75%. In the remaining 4 sentences, there is less agreement because two or three syllables compete for accent and the inter-judge agreement goes down to approximately 50% or less in such sentences. Accent judgment is affected by the informants having or not having formal learning on accent and by the position of the syllable in the sentence.

### 3.3.3. Discussion.

In this discussion the term 'prominent' applies to syllables which are predicted by theories as the syllables which bear accent and 'prominence' to predicted accent. As will be shown below, accent as predicted by theoreticians does not always correspond with accent as perceived by naive listeners. Hence the distinction between the two.

#### 3.3.3.1. Accent in final sentence position.

The most striking result of accent judgment in this study is that -- unlike in previous investigations in Malagasy -- accent is rarely found in the last word of the sentences. Dahl (1952) and Rafitoson (1980) postulated the presence of at least two primary accents (i.e. two prominence loci) in Malagasy sentences (having the same syntactic structures as the ones found in the present data), the second of which is on the last word of the sentence. For example,

V(erb)	O(bject)	S(ubject)	
Manaiky	izány	áho.	(Dahl 1952, p.198).
(accept	that	I)	
(=I accept	that).		

cp.1a      Manambady      dokoté<sup>́</sup>ra      Ratefy.  
 (married      doctor      Ratefy)  
 (=Ratefy is married to a doctor)

V(erb)      A(dverbial)      S(ubject)  
 Hisakáfo      alo<sup>́</sup>ha      isíka. (Rafitoson 1980)  
 (FUT-eat      first      we )  
 (=we shall eat first)

cp.3a      Naléfa      alo<sup>́</sup>ha      ny renin'i Leva.  
 (PAST-send first      DET mother-of DET Leva)  
 (=Leva's mother was sent first).

V(erb)      A(dverbial)      S(ubject)  
 Hisakafo      alo<sup>́</sup>ha      isíka. (Rafitoson 1980)  
 (FUT-send      early      we)  
 (=we shall eat early)

cp.3b      Nalefa      alo<sup>́</sup>ha      ny renin'i Leva.  
 (FUT-send      early      DET mother-of DET Leva)  
 (= Leva's mother was sent early)

In such sentences the predicted prominence in non final position in the sentence was confirmed by the results of the present experiment but not the prominence in the last word of the sentence. The differences between the

accent pattern found in the present results and Dahl's and Rafitoson's may be explained by two factors: i) the judges and ii) the interpretation of acoustic measurements. The acoustic analysis of accented syllables will be the object of the next chapter, so this second factor will not be discussed until then.

The only judge on the prominence of syllables in Dahl (1952) appears to be the author himself, a linguistically trained speaker who is a non native but a fluent speaker of Malagasy. Rafitoson (1980) slightly modified Dahl's theory of accent assignment (the basic difference between the two being in the assignment of secondary accents) but the accent judgment seems to be that of the author's alone (a native speaker) who is also a linguistically trained subject. Yet, it was shown in the course of the discussion above that linguistic training affects listeners' judgment of accent. It follows that objective testing of accent judgment by both linguistically trained and non linguistically trained judges is required. The results of their accent judgment -- as found in this chapter -- disprove the prominence assignment on the last word in Malagasy declarative sentences.

This incompatibility between theoretical assumptions and experimental evidence on sentence accents is not confined to Malagasy. Pilot experiments conducted by Currie (1980) on English tonics did not seem to confirm the predicted sentence accent as claimed by authors such as

Liberman and Prince (1977), Selkirk (1972) and Prince (1983). Those authors predicted the most prominent syllable in English non contrastive sentences to be in the last lexical item of the phrase or of the sentence. According to the results of Currie 's experiments, there were three cues which 29 listeners (native and non native speakers of English who are familiar with the notion of 'tonic') used for tonic identification, namely the cumulation of physical maxima (viz. maximum pitch height, maximum pitch movement and maximum intensity), the rightmost lexical item and the maximum Fo movement. She went on to say that "it is not the case, however, that all those cues combine in every utterance. Nor is it true that the presence of one of these cues (in the absence of the others) will automatically determine the tonic element." (Currie 1980, p.342). Therefore, English tonic cannot be predicted on the basis of the position in the sentence alone. This also contradicts the claim made by Selkirk (1984) in her 'pitch-accent first' theory of intonation that "a syllable associated with a pitch accent is more prominent (on the grid) than any syllable that is not associated with a pitch accent" (p.252), since the results of Currie 's experiments mentioned above showed that in some cases a syllable in the rightmost lexical item was perceived by the majority of the judges as more prominent than another syllable in the same utterance having maximum Fo movement.

Like the Malagasy listeners, the listeners in



Currie's experiments were not unanimous in their tonic assignment since "the number of judgments appears to vary from sentence to sentence, because some judges decided to select one tonic while others decided to select more than one tonic" (Currie 1980, p.334). Nor were they consistent in their selection of the tonic(s): "it was not the case that judge X consistently selected one tonic while judge Y consistently selected 2 tonics" (Currie 1980, p.334). Thus, what an author regards as the most prominent syllable may not be perceived as such by other speakers of the same language.

#### 3.3.3.2. Lexical accent in sentences.

Accent patterns between words in isolation and words within sentences were compared. For example, in experiment 1 the word <dokotera> was assigned accent on [du-] and [-te-] which obtained 56% and 84% votes respectively from the 37 informants. The same word, [duktera], is found in sentences 1a and 1b in experiment 3 (the judges were different from those in experiment 1). The first syllable [du-] received an average of only 8% votes on accent judgment in 1a and 2% in 1b. The syllable [-te-] received a majority of the votes (61%) in 1a but only 9% votes in 1b. The reason is because [duktera] is at the end of an intonation-group (to be defined in chapter 6) and therefore [-te-] carries the nuclear tone in 1a but not in 1b. This provides evidence

that sentence accent is due to intonation.

The same thing applies to other lexical accents in the data of experiment 3. When the word is at the boundary of a non final intonation-group, the last syllable bearing lexical accent is judged accented by the majority of the listeners. Compare, for example (in Appendix 9), <manambady> in 1a and 1b; <nalaiko> in 2a and 2b; <nalefa> in 3a and 3b; <tsotra> in 6a and 6b. The relation between accent and intonation is elaborated in chapter 6 of this thesis.

This brings us to the question of levels of accent in sentences.

#### 3.3.3.3. Levels of accent in sentences.

Should the syllables which are judged accented by a majority of listeners be regarded as primary accents and the other lexical accents in the sentence as secondary accents?. Supposing that all other syllables which received some votes (but fewer than the accented syllables) were to be considered secondary accented and syllables which do not receive any vote at all be considered unaccented, then the secondary accented syllables include the lexical accents in sentence final position (which correspond to primary accents in Dahl 1952 and Rafitoson 1980) and unaccented syllables include [-bav-] in 2a and 2b (this syllable carries lexical accent when the word <anabavy> (sister) is

said in isolation). However, judging from listeners' overall low consistency and the low scores obtained by such syllables (18% or less), a proportion of the scores may be due to chance. On the other hand, very few judges assigned accent to those syllables.

Length may also play a role. In a preliminary experiment where listeners were asked to judge accent in long sentences such as

Ny mpianatra tonga mifana eto England dia faly sahirana...

(DET students come train here England happy embarrassed

(=Students who come to do some training here in England are happy but also embarrassed...))

accent was assigned on <mpampianatra>, <mifana> and <England> but not on <ny>, <tonga> or <eto> (the latter two have lexical accent on the first syllable when said in isolation). It appeared that, in long sentences, words were grouped on a semantic basis, e.g. <ny mpampianatra> (the students), <tonga mifana> (come and train), <eto England> (here in England) and accent assigned within each semantic group. Shorter sentences were designed for the purpose of the experiments reported here because informants found it difficult to do the task of accent assignment when sentences are long. In the data of experiment 3, the fact that almost every lexical accent obtained some scores (unlike in the

long sentence exemplified above) may be due to the sentences being short, but this requires further investigation and further evidence.

Because of lack of evidence of secondary accents, only two levels of accent at sentence level are recognised in this thesis, namely accented and unaccented. The accented syllables in sentences refer to the syllables which are assigned accent by a clear majority of listeners and obtain the highest scores.

#### 3.4. Experiments in English.

After the present results had been obtained, F. Gooding brought my attention to an article which reports the results of similar experiments in English. Lickey and Waibel (1988) conducted experiments on perceptual accent assignments in English sentences by (American) English speakers. In the first experiment where a possible difference between linguistically trained and untrained subjects was assessed, Lickey and Waibel observed more agreement between the trained subjects (roughly 90%) than between the untrained ones. They stated that "the apparent lack of agreement between untrained subjects in judging stressedness indicates that it is a rather subjective percept" (Lickey and Waibel 1988, p.193). In another experiment where only untrained subjects took part, another observation tallies with one of the findings in the present

experiments, namely that "many syllables bearing lexical stress are not perceived as stressed by most subjects in the context of a continuously spoken sentence." (Lickey and Waibel 1988, p.196).

Lickey and Waibel also made an interesting remark concerning stress judgment by trained and untrained subjects. The authors pointed out that "the trained subjects listened for lexical, or word-level, stress" whereas "untrained subjects used some notion of sentence-level stress in making their judgments" (Lickey and Waibel 1988, p.194-195). This was also confirmed in the Malagasy listeners' judgments. 15 out of 24 Malagasy listeners in experiment 3 above judged up to 3 or more accent loci and this number includes 7 (out of 9) trained Malagasy subjects (i.e. who had formal learning on accent). In other words, most of the untrained subjects found 0, 1 or a maximum of 2 accent loci (see Appendix 11-12) although they were allowed to choose any number of syllables per sentence.

However, it should be noted that stress labelling in Lickey and Waibel's experiments was based on the inter-judge agreement alone (i.e. a syllable is labelled stressed if it is chosen by 50% judges) and does not take into account the intra-judge variability (judgment was given only once by subjects although they could listen to the sentences as often as they wished). It has been found in the present experiments that untrained subjects are inconsistent in their accent assignment, therefore the intra-judge

variability should also be taken into account for stress labelling.

A comparison of their results with results from a similar experiment conducted at MIT revealed that both groups of listeners agreed on 76% of perceived-stressed syllables (Lickey and Waibel 1988), which is similar to the inter-judge agreement between Malagasy listeners.

### 3.5. Conclusion.

The results of these experiments show that when multisyllabic words are said in isolation they are, in most cases, assigned two accents but when they are within sentences, only one of the two accents is perceived as accented by most listeners but only if the word occurs at the end at the end of an intonation-group.

At sentence level, there is greatest agreement between judges when only one syllable in the sentence is judged accented but there is less agreement when two or more syllables in the sentence are judged accented. Consistency in accent judgment varies from one informant to another. Linguistically trained informants tend to be more consistent in their accent judgment than non linguistically trained ones. Position of the accented syllable in the sentence affects accent judgment, i.e. the accented syllable attracts more scores when it is in initial or in medial position rather than in final position in the sentence.

## CHAPTER 4

### ACOUSTIC ANALYSIS OF ACCENT

#### 4.1. Phonetic studies of accent.

Most investigations on accent since the beginning of this century have taken the view that accent is realized by specific acoustic parameters. Thus, in the literature, increase of physical parameters such as fundamental frequency ( $F_0$ ), duration and intensity are commonly said to contribute to the realization of accent. Of these phonetic correlates, some are considered as primary, others as secondary, depending on the language under investigation. Accounts of phonetic correlates of accent in a large number of languages abound in published and unpublished materials. The findings on one language may differ from one author to another.

For example, the results of the classic study of Fry (1955) who explored the influence of duration and intensity on the perception of accent showed that while both duration and intensity act as cues in accent judgments, duration was the far more effective one. Those experiments were based on synthesised disyllabic English word-pairs such as 'object' (verb) and 'object' (noun), 'permit' (verb) and 'permit' (noun) and so on in which the duration and intensity of each

vowel were varied. A few years later, Fry (1958) demonstrated that "fundamental frequency cue may outweigh the duration cue".

At about the same time, Bolinger (1958) showed that, in American English, pitch prominence, that is "a rapid and relatively wide departure from a smooth or undulating contour" (p.112), not pitch rise, serves as a cue to (word) accent; this is also the case in British English where pitch movement, not pitch height, determines prominence according to Crystal (1969): "the accentual prominence of a syllable (be it primary or secondary) is reducible to a 'bundle' of phonetic features, the primary feature being a linguistically 'marked' movement of pitch" (p.120).

In French duration is, according to Delattre (1966, p.68), the most important cue to sentence accent for "la duree est le seul des trois elements acoustiques qui soit toujours, par sa proeminence, un facteur de l'accent", with which Crompton (1980, p.231) disagrees, saying that "intensity is a significant correlate of accent in French".

More recently, studies in other languages have revealed that there is a lack of acoustic prominence of accented syllables themselves. For example, in German, acoustic analyses of emphasis for contrast have revealed that cues are to be found after the accented syllables for "Satzakzent... is not signalled by any special  $F_0$  movement within the stressed syllable (except if it is the last one in the utterance), but rather by what happens after it"



(Isacenko and Schadlich, 1970 in Thorsen 1983, p.29).

In Welsh words "the stressed syllable ... has shorter duration, but cannot with certainty be identified with any other acoustic cue" (Williams 1989, p.76). The author went on to say that "rhythm is the foundation of stress in Welsh, and that the stressed penult retains its status of 'stressed' not by virtue of any acoustic prominence it may have in its own right, but because of its function as the keystone of the rhythmic unit" (Williams 1989, p.77).

In Turkish as spoken in Istanbul "l'accent n'[est] pas manifesté ni par une plus grande force d'articulation, ni par une durée plus importante, dans un parler d'un rythme normal (sans mot enclitique, sans accent d'insistance, ni émotionnel) la mise en relief des syllabes est extrêmement faible" (Skalidis Konstantinidis 1980, p.167).

In the case of French, Verluyten (1983) argued against any necessary or obvious correlation between (secondary) accent and phonetic parameters for "the question of the existence of phonetic parameters of secondary stress is at best an interesting side-problem, at worst completely irrelevant to the issue phonologists are discussing" (p.525).

As for Malagasy, Dahl (1952, p.189) claimed that intensity is the acoustic correlate of Malagasy accent but no experimental evidence was provided. Rafitoson (1980) stated that duration is the primary correlate for primary and secondary accent for "la voyelle accentuee, qu'elle

porte un accent secondaire ou un accent principal, est plus longue que les voyelles inaccentuees voisines..."(p.210) whereas Rakotofiringa (1978, p.318) is of opinion that pitch is the most important acoustic parameter of Malagasy accent for "en malgache, la hauteur joue un role plus important que les autres parametres dans la realization de l'accent". Accent in each of the three cases was as judged by the authors who are trained phoneticians.

In this chapter, measurements of intensity, duration, and pitch of the syllables in each of the 48 tokens (of 12 sentences) in experiment 3 were undertaken in order to find out whether accent -- as judged by the Malagasy informants who took part in that experiment -- correlates with any acoustic parameter.

#### 4.2. Acoustic measurements.

Spectrograms were made of the 48 tokens (4 x 12 sentences) which constituted the data in experiment 3, using a sound spectrograph (VII Voice Identification, Inc. 700 series).

Duration (in milliseconds) of the vowels was measured on broad band spectrograms and absolute values were taken (Appendix 14).

Peak intensity (in dB) of the vowels was also measured on spectrograms; relative values were given: 0 (zero) for the highest peak in a token and negative values for the

other syllables in the same token in relation to that peak (Appendix 13). Those values for physical intensity were in the first place converted into positive values by taking 60 dB SPL as representative of typical conversational speech (Borden and Harris 1980, p.41) for the highest (i.e. by substituting 60 for 0 dB). The intensity of a set of Malagasy vowels (in accented syllables of isolated words) spoken by a male speaker was converted into sones which is the unit of loudness, the subjective, psychological sensation of judged intensity. The conversion was done via a program (written by F. Gooding) which took the harmonics spectra as input to auditory filtering and sone conversion (Moore and Glasberg 1986). It was found that the intrinsic intensity of Malagasy vowels was highest in /a/ and lowest in /u/, as also stated by Rakotofiringa (1978, p.169). The positive intensity values mentioned above were then multiplied by the ratio of loudness of Malagasy vowels measured in the speech of that Malagasy informant to obtain the loudness-weighted intensity values which were used in the statistical analyses below. Hence, intensity in the statistical analysis means loudness-weighted intensity.

As for fundamental frequency, measurements were done from narrow band spectrograms by measuring the 10th harmonic at the point in the vowel where  $F_0$  was close to the highest (at the onset or end of the vowel). The measured frequency was divided by 10 to obtain the fundamental frequency

(Appendix 15). When only the lower harmonics (up to the 3rd or 4th) showed up on the narrow band spectrograms (this occurred especially in the case of the high vowel /e/), a section of the vowel was made. Because of the vowel /u/ being short -- especially when followed by a voiceless stop -- the fundamental frequency of this particular vowel was measured by extracting the values of individual harmonics on a FFT spectrum. The  $F_0$  figures in Hz were then converted into ERB (Equivalent Rectangular Bandwidth) values on the ERB-rate scale, which measures the auditory frequency resolution for complex tones (Moore and Glasberg 1986, p.254).

#### 4.3. Acoustic cues to accent.

##### 4.3.1. Statistical Analysis.

In order to test whether accent is cued by physical parameters, a descriptive statistic and the significance test were used.

The relationship between these parameters taken separately and scores of accent judgment (Appendix 9) is described in terms of a correlation coefficient, using Pearson's  $r$  -- also known as Pearson product moment correlation coefficient -- which is a descriptive statistic used for quantifying the amount of relationship between two interval numerical variables  $X$  and  $Y$ . Here,  $Y$  represents

the percentage accent judgment scores for each syllable of a token and X each of the acoustic parameters (pitch, intensity and duration) taken separately, i.e. the acoustic parameters were interpreted as the explanatory variable X, the accent judgment scores as the dependent variable Y. The Pearson's r coefficients are worked out for each token. It was expected that if correlation is to exist between an acoustic parameter and perceived accent, then to the high percentage scores would correspond high values of loudness, pitch or duration and to low percentage scores low values. Hence Pearson r should be positive and some way away from zero.

The null hypotheses in our study is that there is no relationship between scores and each acoustic parameter. If the Pearson's r obtained exceeds the table value at a significance level of .05, then the null hypothesis is rejected and we conclude that there is a significant relationship between the two variables.

#### 4.3.2. Accent and acoustic parameters.

The correlation coefficients between scores of accent judgment and intensity, duration and pitch are set out in the 4th, 5th and 6th columns in Table 3. The underlined figures are those which exceed the Pearson's r values (which are in column 3) that are significantly different from zero at the .05 level (values taken from Cohen and Holliday 1980,

p.334). The underlined figures in brackets are coefficients which are significant but less than the largest correlation coefficient between accent and another parameter for the same token. Although one cannot claim that scores for successive syllables are independent of each other (as a significance test assumes), this is used as a guide rather than a strict test. The figures in bold type indicate a significant negative relationship. The figures in the second column refer to the number of syllables in each token and each token is referred to by the group number who assigned accent to its syllables in the first column.

Only syllable nuclei which were phonetically present were measured. The number of syllables in one token of the same sentence may vary from one speaker to another because of slightly different realizations. This mainly occurs when unaccented /i/ or unaccented /u/ between consonants was pronounced by some speakers but not by others.

For sentence 6a judged by group 3, the sentence was [mandrau sakaf tsutra ze mur] <mandrahoa sakafo tsotra izay mora>, which the speaker judged as the correct translation of the French sentence. The percentage scores of accent judgment in this sentence which are

[mandrau sakaf tsutra ze mur]  
 0 0 79 0 0 4 12 0 45

are not given in Appendix 9 because of the problem in calculating the average scores (the syllables in that

sentence are not the same syllables as in the other sentences) but the correlation coefficients were none the less worked out because here, each token is taken individually.

As was mentioned earlier, group 2 heard 4b instead of 4a (i.e. group 4 heard 4b twice) due to an error in dubbing, hence no figure is given in Table 3 for that particular token.

TABLE 3. Correlation coefficients between  
accent and individual parameters.

Tokens		number of syllables	Minimum signific. r value	r for acc. & intensity	r for acc. & duration	r for acc. & pitch
gr.1	1a	8	.707	-0.037	.479	.555
gr.2	1a	8	.707	-0.462	.154	.394
gr.3	1a	8	.707	-0.271	.601	.658
gr.4	1a	8	.707	-0.188	.432	.623
gr.1	1b	8	.707	.332	<u>.871</u>	.456
gr.2	1b	8	.707	.363	<u>.608</u>	.490
gr.3	1b	8	.707	.272	<u>.792</u>	<u>.679</u>
gr.4	1b	8	.707	.333	<u>.898</u>	<u>(.717)</u>
gr.1	2a	8	.707	.332	-0.055	<u>.820</u>
gr.2	2a	8	.707	.701	-0.007	<u>.836</u>
gr.3	2a	8	.707	.428	.592	<u>.720</u>
gr.4	2a	8	.707	.060	.153	<u>.466</u>
gr.1	2b	8	.707	<u>.761</u>	.010	<u>(.667)</u>
gr.2	2b	8	.707	<u>.561</u>	.617	<u>.859</u>
gr.3	2b	8	.707	.341	.480	<u>.717</u>
gr.4	2b	8	.707	<u>.797</u>	.149	<u>(.775)</u>
gr.1	3a	6	.811	-0.848	.390	.509
gr.2	3a	6	.811	-0.324	-0.267	.691
gr.3	3a	6	.811	-0.845	.081	.319
gr.4	3a	6	.811	-0.775	.173	.652
gr.1	3b	6	.811	-0.731	.443	.603
gr.2	3b	6	.811	-0.773	-0.060	.574
gr.3	3b	6	.811	-0.744	.586	.768
gr.4	3b	6	.811	-0.732	.535	.435
gr.1	4a	8	.707	-0.747	.351	.486
gr.2	4a	8	.707	-0.629	<u>.764</u>	.656)
gr.3	4a	8	.707	-0.978	<u>.617</u>	.348
gr.4	4a	8	.707	-0.978	<u>.617</u>	.348
gr.1	4b	7	.754	-0.694	<u>.775</u>	.339
gr.2	4b	7	.754	-0.079	<u>.174</u>	.466
gr.3	4b	8	.811	-0.479	<u>.842</u>	.620
gr.4	4b	8	.811	-0.824	<u>.199</u>	.052

(continued next page)



gr.1	5a	14	.532	.195	.495	.262
gr.2	5a	14	.532	-0.106	.328	.410
gr.3	5a	14	.532	.341	<u>.867</u>	.483
gr.4	5a	14	.532	.365	<u>.627</u>	.440
gr.1	5b	15	.514	(.515)	<u>.635</u>	.253
gr.2	5b	13	.553	-0.373	.230	.405
gr.3	5b	15	.514	.415	<u>.627</u>	.496)
gr.4	5b	15	.514	.260	<u>.499</u>	.255
gr.1	6a	9	.666	-0.609	-0.017	.293
gr.2	6a	9	.666	-0.640	.455	.547
gr.3	6a	( 9	.666	-0.673	.378	<u>.757</u> )
gr.4	6a	9	.666	-0.686	.244	<u>.382</u>
gr.1	6b	9	.666	-0.457	-0.358	.605
gr.2	6b	9	.666	-0.658	.177	.571
gr.3	6b	9	.666	-0.499	.224	.561
gr.4	6b	9	.666	-0.817	.039	.596

The results reveal that, for the number of syllables in each token (2nd column), the product moment correlation coefficients are positive and are significantly different from zero at the 0.05 level (i.e. the correlation coefficients exceed the values in column 3) in 18 tokens out of 48 for one or another acoustic parameter. This means that, in those 18 tokens, there is a significant relationship between scores of perceived accent and (at least) one of the 3 acoustic parameters under investigation. In the remaining 30 tokens the correlation coefficients are low or significantly negative.

The coefficients describe a significant positive relation between accent and intensity in 3 tokens but a significant negative relationship in 8 tokens, which means

that to high intensity values correspond low scores of accent judgment (see scatter plot in Fig. 3).

There is a significant positive relationship between scores and intensity alone in 1 token, between scores and duration alone in 9 tokens and between scores and pitch alone in 6 tokens. In 3 other tokens the coefficients describe a significant positive relationship between scores and two of the three parameters; for example, in sentence 1b (gr.4) there is a significant relation between scores and pitch on the one hand and between scores and duration on the other; in sentence 5b (gr.1) there is a significant relation between scores and intensity on the one hand and between scores and duration on the other. Altogether, there is a significant and positive relationship between scores and intensity, duration and / or pitch in 18 tokens out of 48, that is in 37.5% of the data. In the remaining 62.5% such relations are poor and sometimes significantly negative.

The best acoustic cue may vary from one sentence to another, for example pitch or intensity in 2b but duration in 4b. It may also vary from one token of the same sentence to another; for example, intensity and duration in one token of 5b (gr. 1) but duration in another token of 5b (gr.3). In some cases, correlation exists between scores and at least one acoustic parameter in only one or two tokens of the same sentence (4a, 4b, 5a, 5b, and 6a). Furthermore, there was no positive correlation between accent and acoustic parameters in any of the four tokens of 1a, 3a, 3b

Fig.3. Scatterplot showing a negative relationship between Intensity and scores of accent judgment (2b,gr.2).

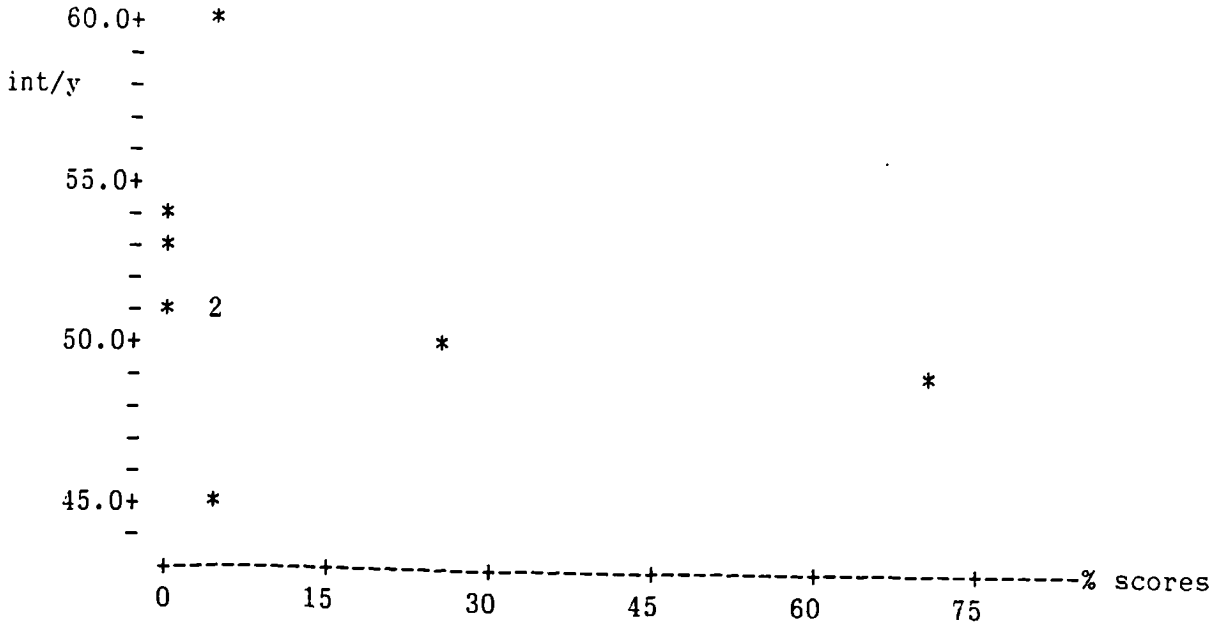
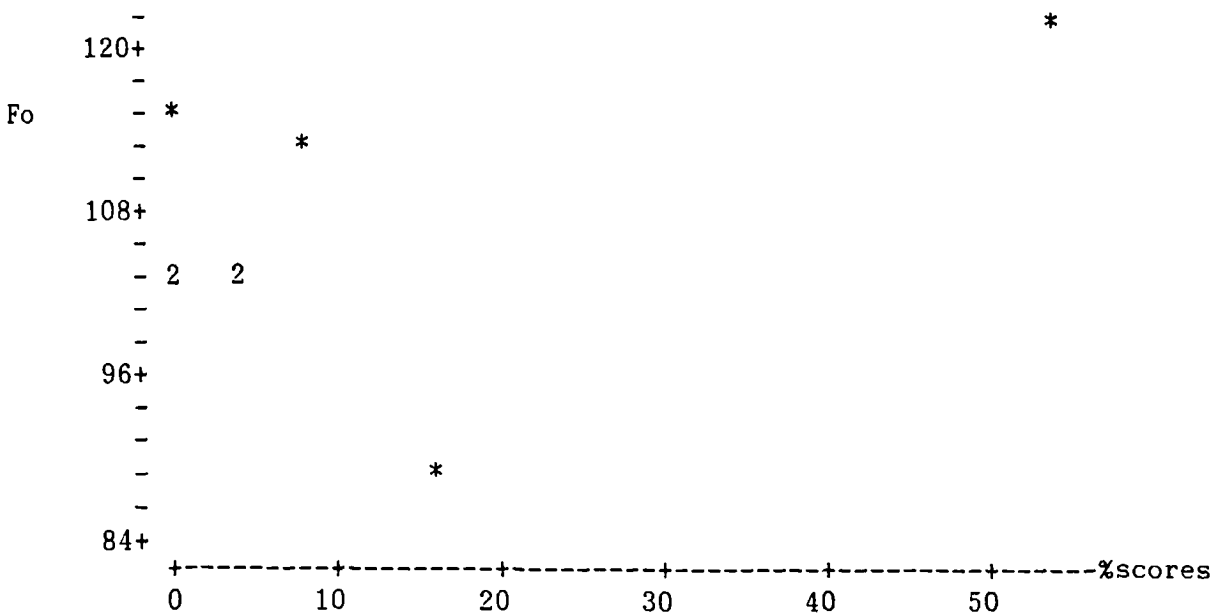


Fig. 4. Scatterplot showing a low positive relationship between Fo and scores of accent judgment (1a, gr.2).



and 6b.

The eventuality of pitch glide being associated with accent, as in English (Bolinger 1958, Crystal 1969), was also examined. Only two Fo patterns occurred within the accented syllables, namely a level pitch or a rising pitch. The former occurred after voiced consonants /mb/ /l/ /m/ /g/, and the latter after voiceless consonants /t/ /k/ and /ts/. Such patterns are known to be the effects of consonantal environment (Ilse and Peterson 1961, Rakotofiringa 1978) and therefore, it is reasonable to assume that perceived accent is not associated with pitch glide in Malagasy.

These results show that accent is not systematically cued by any specific acoustic parameter in Malagasy.

#### 4.3.3. Non acoustic cues.

Brown et. al. (1980) posited non acoustic cues for tonic identification (in English), namely the final position in the sentence since they observed that "the last lexical item plays a very important part in this identification" (Brown et. al. 1980, p.154). It was not the case that a syllable having physical prominence (maximum pitch height, maximum pitch movement or maximum intensity) was always identified as the tonic. For Malagasy, the situation is quite different because accent was very rarely judged in final sentence position (see 3.8.1.).

Context is another non phonetic cue suggested by the

same authors (Brown et. al. 1980, p154). When the target sentences were given without any context, the listeners used pitch height, pitch glide or the last lexical item to identify the tonic (in non contrastive sentences). When the target sentences were given in a context (i.e. surrounded by three or four other sentences) and no phonetic cues were present (the listeners did not hear a tape of the sentences) the subjects tended to choose the last lexical item but there was also a tendency to pick other lexical accents as well. When they heard a tape of the sentences put in a context (i.e. both phonetic cues and context were present), fewer items were identified as tonic and there was more agreement between the judges on the tonic syllables.

Non phonetic cues are, no doubt, not confined to these and it is hoped that future investigations will have more to say about them.

#### 4.4. Accent and its acoustic correlate(s).

The view that accent is associated with physical prominence is now looked at. The prediction is that, if accent correlates with physical prominence, the accented syllable will be associated with the maximum F<sub>0</sub> peak, intensity or duration. This means that, whether the correlation coefficients in the statistical analyses above describe a high or low positive relationship between the overall scores of accent judgment and acoustic measurements

(Fig.4 & 5), to the highest score would correspond the highest value for Fo, intensity or duration. Scatter plots were used for looking at such a relation. The focus is on the accented syllables only, that is the syllables which were judged accented by 50% or more informants.

#### 4.4.1. Relationship between accent and intensity.

Maximum intensity coincides with maximum scores of perceived accent in 13 out of 48 tokens. In the majority of the tokens peak intensity was found on a syllable other than the accented one and there was a negative relationship between intensity and scores of accent judgment in many cases. Therefore, greater intensity cannot be said to be an acoustic correlate of accent in Malagasy.

#### 4.4.2. Relationship between accent and duration.

Maximum duration coincides with accent in 16 tokens.

The poor relationship between accent and duration is explained by the fact that in many instances, the syllable in final sentence position which has longest duration is assigned low scores of accent judgment.

The position of the syllable in final position in phrases or sentences is known to be one of the variables which influences vowel duration. Previous investigations have shown that the phenomenon called final lengthening

occurs in languages such as Swedish (Lyberg 1980, p.102), English, Welsh (Williams 1989) and so on. This is also found in the present Malagasy data. In 23 tokens the syllable (which carries lexical accent) in final position in the sentence is the longest in duration. However, this final syllable receives a very low average percentage score of accent judgment (18.5% or less). Compare, for example, the duration of the following accented syllable nuclei (underlined) with the (lexically accented) syllables in final position (with a accent mark) (see Appendix 14):

- e.g.in 1a     [...duktera ratef]     '
   
 2a     [nalaiku....ndraik]     '
   
 3a     [naleefa.....leva]     '
   
 6a     [mur andraun]     '

The fact that the final and (phonetically) longer syllables were not judged as accented in the present data provides evidence that duration is not a reliable cue to accent in Malagasy.

In 8 other tokens vowels in non final sentence position were longer than the accented ones, as in 3 tokens of 1a where the nucleus of [mbad] is longer than that of [ter], in 2 tokens of 4a (gr.3 and gr.4) where [e] in [renn] is longer than [u] in final [lu], and so is [lef] compared to [renn]

n 3 tokens of 4b (gr.1, gr.2 and gr.4).

To account for duration as an acoustic correlate of accent raises questions concerning the intrinsic duration of vowels and the effect of the preceding and the following consonantal segment on vowel (phonetic) duration. When everything is equal, an open vowel is longer than a close vowel, and a voiced consonant increases the duration of the preceding vowel whereas a voiceless consonant decreases it. Given these factors, would an accented close vowel (/i/ or /u/) followed by a voiceless consonant be shorter than an unaccented open vowel (/a/) followed by a voiced consonant? The case is illustrated in sentence 6b where the accented syllable [tsu] contains a close vowel /u/ preceded and followed by voiceless consonants and a post-accented syllable [tra] contains an open vowel /a/ followed by a voiced consonant. In all the tokens of 6b the duration of the accented vowel in [tsu] is generally shorter than the unaccented vowel in [tra], providing evidence against the claim that duration is the best acoustic correlate of accent in Malagasy.

F<sub>0</sub> movement is another factor which may affect duration, according to the F<sub>0</sub>-dependent model (Lyberg 1981, Umeda 1976); that is to say, a syllable which contains a pitch movement is longer than a syllable which does not. This appears to be the case in Malagasy too. The accented syllables of [manambád] and [dukté<sup>́</sup>ra] in 1a and 1b, [naláiku] and [sakáfu] in 2a and 2b, [naléfa] in 3a and 3b



(also in 4a and 4b), [tsútra] and [múra] in 6a and 6b are longer when they contain a pitch rise (step up or glide) in one sentence than when they do not in the other sentence (Appendix 14-15). Thus, the greater duration is linked with Fo rise in the present data.

#### 4.4.3. Relationship between accent and pitch.

As for the relationship between accent and pitch, in 30 tokens the highest pitch is found on the accented syllables. In 16 other tokens the accented syllable is also pitch prominent but its Fo is exceeded by another peak. The following explanations are suggested for those cases.

In the 4 tokens of 5a the Fo peaks in final position can be explained by segmental variations; in 5a the two syllables [-ga-] and [-ka-] have the same nuclei [a] preceded by consonants having the same place of articulation (velar); but it is known that voiceless consonants tend to increase the Fo of the following vowel (see Lehiste and Peterson 1961 and Umeda 1981 for English, and Rakotofiringa 1978 for Malagasy). As a result, the Fo of [ka] in final sentence position is phonetically higher than that of [ga] in 5a. The difference between the two Fo peaks is in the range of 2 to 10 Hz.

In 2 tokens of 1b (gr.1 and gr.2) the two syllables under consideration are [-mba-] and [-te-]. Close vowels are known to have higher intrinsic Fo than open vowels

(Peterson and Lehiste 1961, Rakotofiringa 1978) so that [e] has a higher Fo than [a] if everything is equal; in addition [e] is preceded by a voiceless consonant -- which increases Fo -- and [a] by a voiced consonant. Consequently, [te] has (phonetically) a higher Fo than [mbad], the difference being 8 Hz. But note that in the other 2 tokens of 1b the Fo of [tef] is very close to that of [mba], the difference between only 2 to 4 Hz.

But when everything is equal, that is to say when the final (word) accented syllable and the (sentence) accented syllable have identical nuclei preceded by consonants having identical place and manner of articulation -- as for example in 1a, 2a and 3a -- the sentence accent has higher Fo values than the final word accent.

Pierrehumbert (1979) who conducted an experiment on the perception of Fo declination by English speakers showed the role played by amplitude downdrift in the perception of Fo. Given two non adjacent nonsense syllables having equal Fo peaks, the second peak was perceived by English listeners as less prominent if it was 4db less than the first peak. She concluded that "the amplitude downdrift which typically accompanies Fo downdrift was also found to have a part in the mental representation of declination" (Pierrehumbert 1979, p.368). Although an experiment of that kind has not been conducted in Malagasy, the amplitude downdrift could also explain why the final Fo peak was not perceived as accented by the Malagasy listeners since the intensity

figures (Appendix 13) show that the final syllable had a relatively lower amplitude than the accented syllable in all the sentences (the average difference of amplitude between the two syllables carrying Fo peaks was -9.5 dB in 1b and -4.87 dB in 5a).

There was further evidence that unaccented syllables had high pitch. The most obvious case is that of unaccented [-fa-] in the 4 tokens of 3a and the 4 tokens of 4b where [-fa-], in [nalefalu] is between two accented syllables and has equal or higher Fo than those neighbouring accented syllables but receives a maximum score of 3%.

The fact that the highest Fo in sentences like 1b and 5a were not perceived as accented implies that accent judgment cannot be accounted for on the basis of maximum Fo values alone in Malagasy.

It appears that of the three acoustic parameters traditionally associated with accent, namely higher intensity, longer duration and higher pitch, the latter is by far the best acoustic correlate of accent in Malagasy but the fact that some non accented syllables also contained a pitch peak suggests that non acoustic factors are involved in accent judgment. This will be dealt with later on in this chapter (see 4.6. below).

#### 4.4.4. Role of acoustic parameters in perceived accent.

The implication is that accent cannot be identified on the basis of single acoustic parameters (such as higher intensity, higher pitch or longer duration) alone. As Hirst (1977, p.30) put it "acoustic evidence alone is not always sufficient to account for the identification of stress."

One of the problems with current analyses in phonetics is the influence of visible speech signals. Instrumental phonetics have undoubtedly brought considerable contribution in phonetic analyses but, on the other hand, phoneticians tend to give too much importance to phonetic details, to the point of considering them as linguistically significant without taking into account naive listeners' perception.

For example, in English, the results of an experiment conducted by Quirk and Crystal (1966) did not confirm the necessity to distinguish between a high level, a high fall and a high rise as O'Connor and Arnold (1961) or Kingdon (1958b) did. In Crystal (1969) these three tones fall into one of the two types of nuclear tones, namely 'rising' (Crystal 1969, p.203) -- as opposed to the 'falling' type. A recent description of English intonation by Pierrehumbert (1987) also distinguishes between only two types of pitch-accent, namely high and low. Moreover, the results of pilot experiments reported in Brown et. al. (1980, p.141-

154) do not seem to support the claim made by Selkirk' s (1984) "pitch-accent first" theory, i.e. that the syllable which carries a pitch accent is to be represented as the most prominent on the metrical grid. In the data of Brown et. al.'s experiments, the last lexical items were often picked by the listeners as the tonics although maximum Fo height and / or maximum Fo movement were located in another syllable of the same sentence (Brown et. al. 1980, p.154).

In Malagasy, the recurrent final Fo peak could be taken as significant if one considers the acoustic signals alone or the judgment of trained phoneticians alone. The previous investigators on Malagasy accent seemed to have been influenced by their acoustical analyses and saw in this recurrent final Fo peak a linguistically significant feature of accent. The implication of the results of experiment 4 in this thesis is that what linguists consider as significant at the phonetic level is not necessarily so at the auditory level.

Having shown that higher intensity was not an acoustic correlate of accent in Malagasy, that longer duration was closely linked with high pitch and that high pitch was always present in the accented syllable (although it may sometimes be superseded by another peak), the question of the relation between accent and intonation is raised. Is high pitch a manifestation of accent or a feature of intonation in Malagasy?

#### 4.5. Accent or tone?

The issue of whether accent is or is not to be distinguished from intonation has been a long standing matter of controversy in phonological studies.

According to Williams (1986) "intonational phenomena are essentially distinct from stress phenomena in Welsh". The evidence given is the fact that in Welsh higher pitch or pitch glide occurs on the unaccented ultimate syllable (Williams 1986, 1989). Williams (1989, p.220) explained how accent in Welsh used to be on the ultimate syllable but shifted to the penult as a result of the Old Welsh Accent Shift which took place between the fifth and eleventh centuries (views differ from one author to another). She went on to point out that the old Welsh accent was signalled by pitch but after the Welsh Accent Shift, the new accent is signalled by rhythm and by vowel and consonant length while higher pitch remains on the ultima (Williams 1989, p224). Unless other investigations contradict this claim, the case of Welsh provides a good illustration of the separation between accent and intonation.

In English, Crystal (1969) distinguishes between two types of prominence, namely 'stress' and 'accent'. The difference between the two being in the perceptual factor which plays the major role: "in the case of stress, the dominant perceptual component is loudness; in the case of accent, the dominant component is pitch" (Crystal 1969,

p.120). In his theory, a syllable can be perceived as accented although it has no pitch movement, suggesting that accent can be distinct from intonation in English. However, in their discussion on the so called secondary and primary accent in English, Vanderslice and Ladefoged (1972, p.325) observed that the greater prominence on a nuclear syllable should be attributed to intonation and they concluded that "nuclearity is a matter of intonation... Therefore, it is not only possible but (we believe) obligatory to factor out that extra prominence, attribute it to the feature Intonation, and declare all accents equal."

In Malagasy, Rafitoson (1980, p.295) claimed that, at least in Merina, "la distinction entre accent et intonation peut et doit etre maintenue". Like many other linguists, she views accent in term of acoustic prominence (duration) and her main argument lies in the linguistic reality of the secondary accent which can be distinguished from the primary accent by its quality (accent de duree). That is to say, both the secondary and the primary accents are characterised by longer duration (as compared to the unaccented vowels in a sentence) but a secondary accent is not necessarily shorter than a primary accent, the latter being characterised by the presence of a high pitch (accent de duree + hauteur). She also states that the nuclear tone performs the same functions -- namely demarcative and distinctive -- as the primary accent (accent de duree + hauteur) since they occur on the same syllable (Rafitoson

1980, p.295). This implies that if there is evidence against the linguistic reality of the so-called secondary accent, accent and intonation ARE linked in Malagasy. The judgment of accent by Malagasy informants in experiment 4 reported in this thesis provides no evidence of a secondary accent since some lexical accents (Rafitoson's secondary accents) received very low average percentage scores or no score at all.

One way of finding out whether the high tone which is traditionally associated with 'accented' syllables is a feature of intonation or a manifestation of accent is by investigating Malagasy people's realization of accent when speaking a language which has accent on non final syllables. English was chosen for that purpose.

#### 4.5.1. Accent and intonation in Malagasy English.

Pronunciation has been given very little attention in the teaching of English in Madagascar. In very rare cases are the pronunciation of segments and the accent placement referred to but hardly anything is said on English intonation. Consequently, Malagasy speakers generally speak English with a Malagasy intonation. The illustrations in this section have been taken from 5 passages spoken in English (4 monologues and 1 news bulletin) by Malagasy speakers.

The hypothesis is that if Fo peak is a feature of



intonation, then, when Malagasy speakers correctly accent English multisyllable words (which have accent on non-final syllables), this Fo peak will occur on a post accented syllable of the same word when the word is at the end of an intonation group. Putting this differently, if Fo peak is a feature of accent -- and not of intonation -- then it will occur on the initial accented syllable but not on the post accented syllable.

Following Cruttenden (1986), English intonation is here described in terms of intonation groups (the slant line / indicates the intonation-group boundary) and nuclear tones, e.g.

The first man on the /moon/ was Neil \ Armstrong  
(Cruttenden 1986, p.77)

A typical intonation pattern of Malagasy-English (hereafter Mlg-Eng) is illustrated in Fig.5. The contour is very much similar to the contour of Malagasy sentences as illustrated in Fig.6. Compared to RP English intonation, Mlg-Eng makes use of smaller pitch range and lower key. Unlike RP English which has between four and seven nuclear tones -- authors do not always agree on the number (e.g. Kindon 1958b, Crystal 1969, p.210-211, Cruttenden 1986, p.55-62) -- Mlg-Eng has only one nuclear tone, namely 'rise' (i.e. a step up in pitch or an upwards pitch glide). In Mlg-Eng the Fo contour preceding the

Fig; 5.

Intonation pattern in Malagasy-English (fem. speaker)  
in the sentence 'and the result is quite profitable'

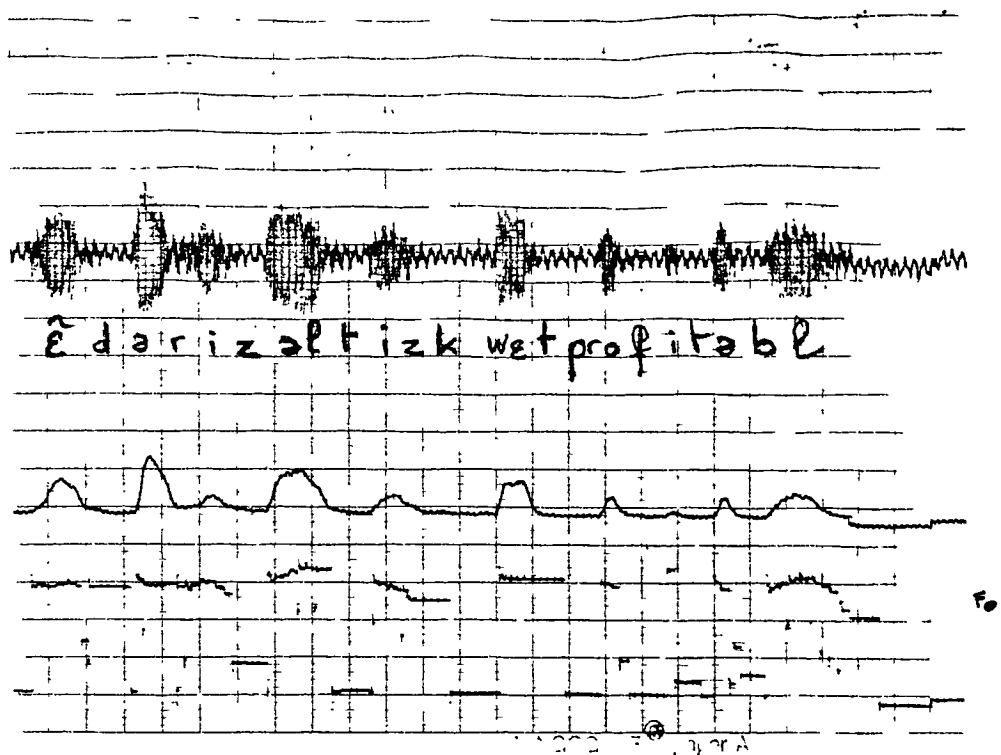
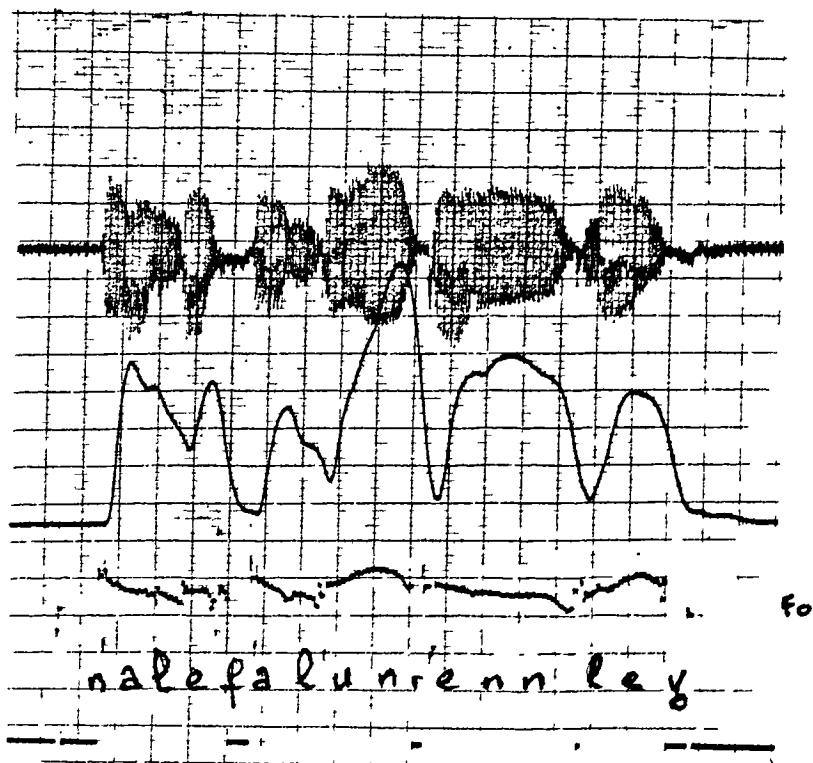


Fig.6. Intonation pattern in a Malagasy sentence  
'Nalefa aloha ny renin'i Leva' spoken by another  
female speaker.



nuclear syllable is relatively flat and rises at the nucleus. Intonation groups in MLg-Eng are often longer than in RP and one intonation-group in MLg-Eng could be split up into two or more intonation-groups in RP. For example, the following sentence contains only two intonation groups in Mlg-Eng.

I've been in Newcastle for nearly twelve months /  
and I can say that I've enjoyed my stay there

When a multisyllable English word which has lexical accent on the non-final syllable (e.g. students, umbrella, experience, condition, problem, difficult, etc...) occurs in the nucleus position, different patterns occur in Mlg-Eng depending on the position of the intonation-group in the sentence, viz. final or non-final position.

When the Malagasy speaker accents the correct (non-final) English accented syllable, then both the accented syllable AND the final syllable have a high pitch in non-final intonation-groups but only the accented syllable has a high pitch in final intonation-groups (Fig..). Putting this in another way, given an English word having two syllables A and B (with the accent on A) which occurs at the end of an intonation-group, when the intonation-group is in non-final position, both syllables A and B have a high pitch; but when the intonation-group is in final position only syllable A has a high pitch,

The presence of high pitch on both accented (initial) syllable and post accented (final) syllable can be explained as follows. Accent is realised by Malagasy people by a rise in pitch. In Mlg-Eng, a high pitch on the initial accented syllable is the realisation of accent and a high pitch on the final unaccented syllable (of the same word) results from the intonation pattern.

That the high pitch on the post accented syllable is a function of intonation is proved by the fact that it is present when the word is in non-final sentence position, suggesting that it indicates 'continuation' but in sentence final position it has a low pitch which indicates 'finality', as in the intonation pattern of Malagasy sentences.

In the pronunciation of Malagasy speakers who are not aware of English word accent (who do not pronounce English words with lexical accent) in such multisyllable words, the final syllable alone carries a high tone when the word is at the boundary of intonation-groups (final and non final) as in the intonation pattern of Malagasy sentences.

It is probably this high pitch at the end of sentences which gives English listeners the impression that Malagasy speakers -- as well as other foreign speakers of English -- stop when they are expected to continue. In this case, English final unaccented syllables are made prominent by the high tone. This was testified by the auditory perception of seven English judges (all RP speakers) who

were asked to listen to samples of English sentences spoken by Malagasy speakers and who stated the difference between Mlg-Eng and their English intonation in these terms: "emphasis is on the last syllables", "each phrase ends on a high note", "speaker raises the tone on the final syllable" and so on. Although this auditory perception by English speakers was not the object of a proper experiment, it is an interesting piece of information which will have some relevance to a point discussed later on in this chapter (see 4.6.2 .below).

It was hypothesised that this realization of accent with a pitch rise may be confined to the realization of accent when Malagasy speakers speak English and this hypothesis was tested by using Malagasy loan words.

#### 4.5.2. Experiment 4: Realization of accent.

Twenty-two of the multisyllable loan words of experiment 1 were put in short carrier sentences (see Appendix 16) and given to two native speakers of Merina (one female and one male) to read in three different random orders. The reading was done in two ways. For the first reading the two speakers were asked -- independently -- to read the 3 randomized lists without any further instruction; for the second reading (of the 3 same lists in random orders) they were asked to pronounce the initial syllable of the target words with accent (Mlg. <tsindrimpeo>). An

accent-mark was written above such a syllable for that purpose. This was chosen in the 22 target words because the results of experiment 4 showed that in most cases accent was perceived by Malagasy informants on both the initial syllable of the word and on the ultimate or the penultimate one. Pronouncing with accent was apparently understood by the speakers as pronouncing with greater articulatory effort. This greater articulatory effort was accompanied with nodding of the head by the female speaker while performing the task. In this experiment the term 'accented' (with single quotes) is applied to the (initial) syllables which the speakers pronounced with accent.

The target words were situated at intonation group boundaries (to be defined in chapter 6) and therefore, they were expected to carry a high tone. The ultimate syllable which carries a high pitch is traditionally considered as having a primary accent (Dahl 1952, Rakotofiringa 1978, Rafitoson 1980). It was predicted that if the high pitch on the ultimate syllable is due to intonation and not to 'accent', then it will still occur even when the speaker 'accented' the initial syllable during the second reading.

Acoustic measurement of the  $F_0$  (in Hz) of the initial and the (phonetic) ultimate syllables were done on narrow band spectrograms. The figures in Appendix 17 are the average values over the 3 repetitions of each word by the male speaker.

Comparison was made between the  $F_0$  of the initial

syllable when it was 'accented' (+ accent in Appendix 17) and the ultimate syllable. The results confirmed the prediction. The 'accented' initial syllable had higher pitch than the ultimate syllable in only 13.6% cases. This means that even when the initial syllable is 'accented' by the speaker, the ultimate still carries a high tone (Fig. 748), showing that the high tone on such syllables is not a feature of accent but of intonation. The difference between the initial ('accented') and the ultimate syllables was from 6 to 50 Hz. As for intensity and duration, the 'accented' syllable had higher intensity than the ultimate syllable in 27% cases and longer duration in 22% cases, which implies that the ultimate unaccented syllable had longer duration, higher intensity and higher pitch in most cases.

Comparison was also made between the  $F_0$  values of the initial syllable when it was not 'accented' (-accent) and when it was (+accent). 'Accent' on the initial syllable was realized by higher pitch (as compared to the same initial syllable without 'accent') in 100% cases, ranging from 1 to 41 Hz (but the post 'accented' one had higher  $F_0$  than the 'accented' one), confirming the claim that accent is realized by a rise in pitch. It was also realized by a rise in intensity 22% cases and an increase in duration in 72% cases.

Due to the small number of Malagasy people in Britain at the time of the present experiment, only two listeners

Fig.7. Target word 'palitao' in a carrier sentence  
spoken by a male informant (without 'accent')

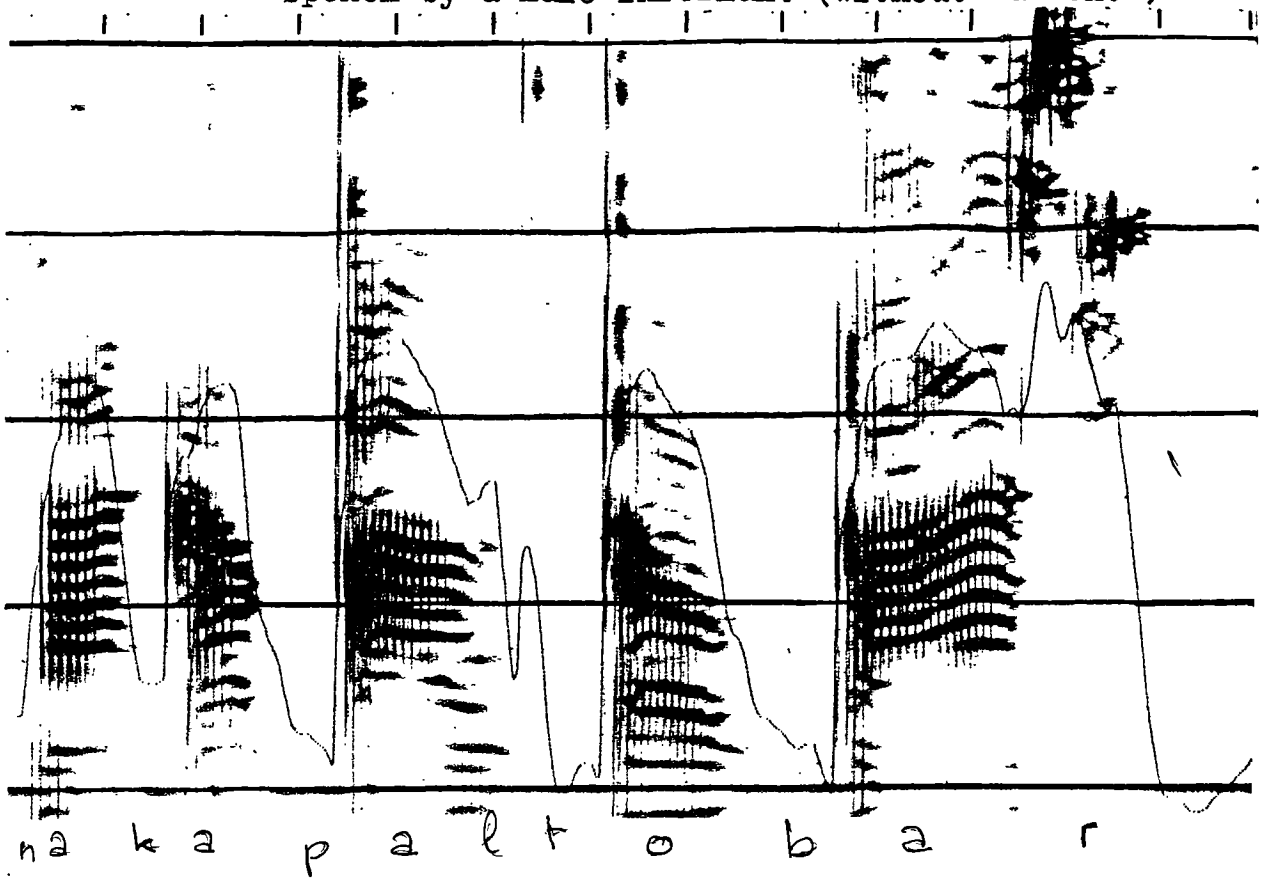
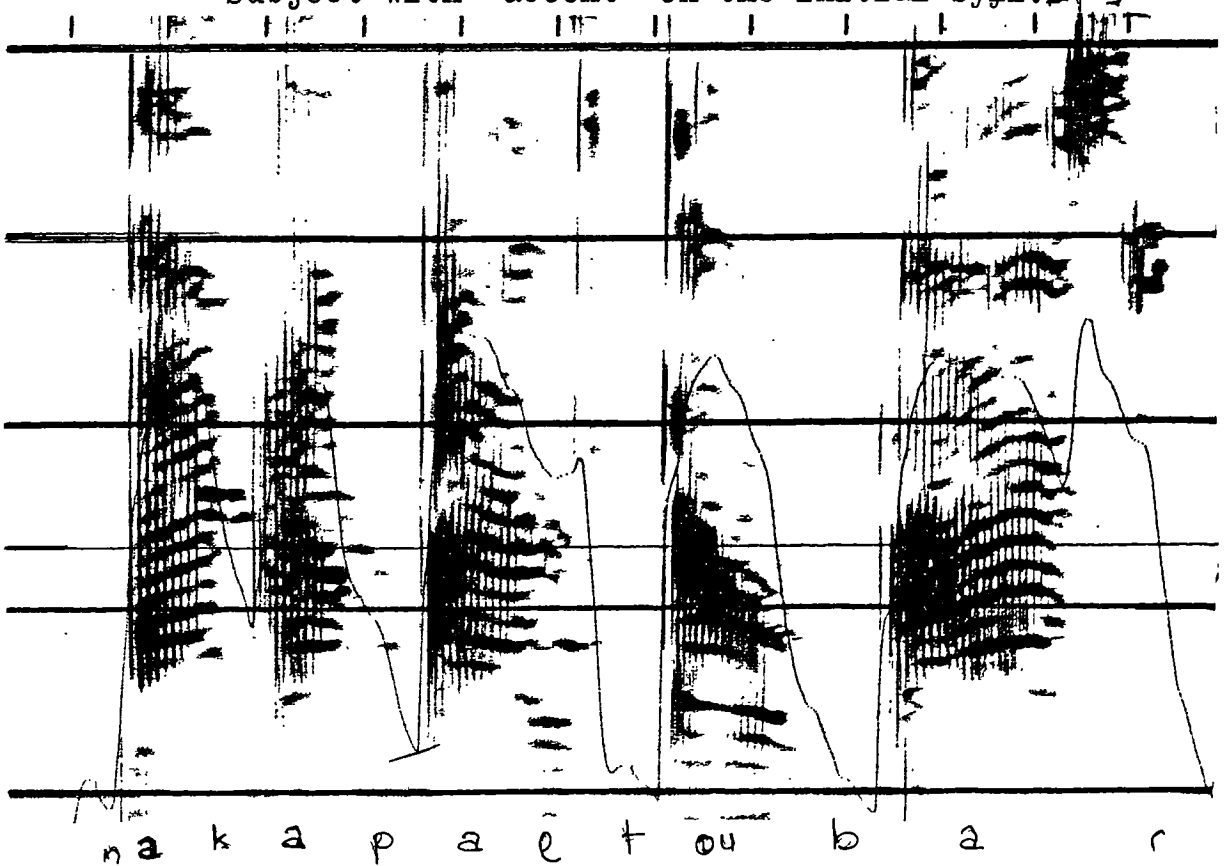


Fig.8. The same sentence above spoken by the same  
subject with 'accent' on the initial syll. [pa]





(both female) were available for judging accent in those target words where the initial syllables had been 'accented' by the male speaker. The two listeners agreed on the accent being on the ultimate syllables (which had a high tone) in 16 words out of 22 but there was no agreement on any single 'accented' initial syllable (one listener judged the initial syllable as accented in some words and the other listener judged it accented in some other words). Putting this in another way, although the speaker 'accented' the initial syllable, it was the ultimate ('unaccented') syllable with a high tone which was judged by the listeners as accented.

The pronunciation of such words with accent on the initial syllable is not common in Malagasy (as one of the two speakers commented, putting accent on the initial syllable was not 'normal' except if the words were said in isolation) but this experiment was nonetheless useful to prove that the high pitch on the ultimate syllable is due to intonation and not to accent.

#### 4.6. Non-acoustic factor involved in accent judgment.

As was mentioned earlier, acoustic prominence alone does not account for perceived accent and that listeners may use some non-acoustic factors in their accent judgment. One such factor may be their knowledge of the native language. This is tantamount to saying that if listeners were to judge

accent in a non-native language, their judgment of accent in that foreign language would differ to a certain extent from the native speakers' judgments.

#### 4.6.1. Accent judgment by non-native speakers.

The hypothesis that non native listeners' judgment of accent would differ from native speakers' was tested in a pilot experiment on Malagasy listeners' accent judgment in English words pronounced by a Welsh speaker.

#### 4.6.1.2. Experiment 5: Malagasy listeners' judgment of accent in Welsh-English

##### 4.6.1.2.1. Informants.

7 Malagasy students -- native speakers of Merina -- (5 in France and 2 in Britain at the time of the present study) aged between 20 and 45 took part in this pilot experiment.

##### 4.6.1.2.2. Data.

25 polysyllabic English words (see Appendix 18) were extract from spontaneous speech (a sermon). Seven of them (namely 'consider', 'difficult', 'struggle', 'wrestling', 'example', 'physical', and 'motive') occurred twice in the data, that is there were two different tokens of those

words. The speaker is a Welshman from Llanelli, South Wales, in his early 30's. He has lived in Bangor, North Wales, for 12 years (with a break after the 3rd year) and speaks with a South Walian accent in the opinion of North Walian.

The words were dubbed onto a cassette -- in the order they occurred in the sermon -- either in isolation or in a phrase/ sentence when it was difficult to isolate them. Then, they were written down on a sheet of paper. Whenever the target word appeared in a phrase or a sentence, the other words in the phrase / sentence were put in brackets, e.g. (it is a ) difficult (life).

#### 4.6.1.2.3. Procedure.

The informants were given response-sheets on which the list of words and phrases / sentences was written, and were asked to mark the syllable(s) they judged as accented -- i.e. having a 'tsindrimpeo' (in Malagasy) or a 'accent' (in French) -- in the words which were not in brackets as they listened to them from the cassette. They were told that the words may have no accented syllable, or may have one or two or more, and that the two repetitions of one word may not be identical. They could listen to the words / phrases / sentences as many times as they wanted to. Each informant performed the task independently and only once.

Each syllable is given a score of one whenever it is

judged as accented by a listener. If one syllable was judged as accented by all the 7 listeners, it would receive a score of 7, which would represent 100% judgment scores. The scores obtained by each syllable are found in Appendix 19.

The speaker also performed the task of accent judgment in his own speech, the reason was to see whether the syllables he accented corresponded to the accented ones in English.

#### 4.6.1.2.4. Results.

The syllables accented by the Welsh speaker correspond to the syllables which have lexical accent in English words as indicated, for example, in dictionaries. Therefore, they are referred to as accented syllables. The term 'non native accent' is applied to the syllable which is perceived as accented in the Malagasy listeners' judgment.

The results showed that in 13 words out of 25 there were 2 non native accented syllables per word (these 2 syllables had equal or very close scores, the difference of scores -- if any -- being only 1). One of those syllables was the accented one and the other syllable is in most cases is the one which immediately follows the accented syllable, except in the two tokens of the word 'consider' (no.2 and 11). By judging from those scores, it seems that the small difference in scores arose from the fact that the

proportion of listeners who judged one syllable as accented and that of those who judged the other were almost equal.

In 5 other words the score of the accented syllable exceeds that of the following syllable by 2 or more points. The percentage of informants who assigned accent to the accented syllable in those cases was 71% or more.

In the remaining 7 words the score of the syllable immediately following the accented one (post accented) exceeds that of the accented syllable by 2 or more points. The proportion of informants who judged accent on the post accented syllable was 57% or more.

Thus, the accented syllables received the highest score in 5 words and the post accented syllable in 7 words. In the other 13 words the scores were divided.

The score for the accented syllable is clearly superior in only 2 of the 5 words mentioned above, namely 'example' (no.6) and 'illness' (no.23). This means that in the other 23 words the score for the post accented syllable was very close, equal or superior to the score of the accented syllable.

In view of the fact that naive informants tend to be inconsistent in accent judgment, it can be assumed that both the accented and the post accented syllable were perceived by the listeners as accented.

The question of which acoustic parameters did they use for judging accent was then examined.

Spectrograms of each word was made and the three

acoustic parameters (intensity, duration and pitch) were measured for each syllable. Following Brown et. al. (1980) the highest Fo is represented with the letter A -- under the syllable where it occurs -- (see Appendix 20), maximum Fo movement with B, highest intensity with C, and longest duration with D (the latter is not included in Brown et. al.).

The results show that in the 5 words where the accented syllable had the highest score, a pitch glide is present in the accented syllable of four words and pitch height in one word. In addition, no physical maximums is found on the post accented syllable in three words (no.13, 16 and 18), which may explain why the accented syllable received the highest score. When a physical maximum is present in the post accented syllable (as in no.10 and 23) a pitch glide seems to be preferred to a pitch height in no.23 but a combination of high pitch and longer duration wins over a combination of pitch glide and peak intensity in no.10.

In the 7 words where the post accented syllable had the highest score pitch glide was found in the post accented syllable in four words, pitch height in two words and longest duration in one word. This suggest that pitch glide is a strong cue to accent judgment but in the absence of a pitch glide pitch height takes over.

In the 13 words where scores were divided over two syllables, the physical maxima are set out in Table ... below.

Table ... Acoustic parameters in the two accented syllables in 13 words.

no.	Syllable 1				Syllable 2			
	A	B	C	D	A	B	C	D
1a	x					x	x	x
1b		x			x		x	
2		x					x	x
3			x		x			
4			x			x		
6			x			x		
8			x			x		
11			x			x		
12			x			x		
15		x						
17		x	x	x				
19	x			x		x		
21			x		x			

Legends:

- A : Maximum Fo height
- B : Maximum Fo movement
- C : Maximum intensity
- D : Maximum duration.
- x : presence of those acoustic parameters

The scores of accent judgment in those 13 words were:

4 3  
1a. <author>

1 4 3  
1b. <perfector>

3 4 1  
2. <consider>

3 4  
3. <difficult>

4 4  
4. <pictures>

4 3  
6. <wrestling>

3 3  
8. <wrestling>

4 4  
11.<consider>

5 4  
12.<motive>

1 3 4  
15.<original>

2 2 3  
17.<christianity>

4 3  
19.<motive>

4 5  
21.<physical>

It appears that non native accent judgments diverge when pitch height or pitch glide is present in one syllable and peak intensity in the other. Duration does not play a major role because it always occur in combination of one or two other parameters whereas the presence of pitch height, pitch glide or peak intensity alone can determine non native judgment of accent. In no.15 and 17 no physical maximum was found in the second syllable. The scores for the syllables in no.17 were spread over three syllables resulting in the scores being very low; this is perhaps due to this word being the longest (5 syllables). In no.15 a possible explanation for the non native accent on the second syllable is the length of the consonant [dz] preceding the vowel (200ms). Longer consonant duration is one of the cues to accent in the perception of Welsh speakers (Conolly 1981, Thomas 1984, p.185, Williams 1989, p.78) but whereas for native Welsh speakers it is a cue to accent on the



preceding vowel, for non native speakers it seems to be a cue to accent on the following vowel. If such is the case, then consonantal length -- which was also present in most of the words in the present data -- is an additional cue to the Malagasy listeners' judgments of accent.

In summary, Malagasy listeners' accent judgment in English words spoken by a Welsh speaker differed from the speaker's judgment; in most cases the Malagasy listeners judged the post accented syllable as well as the accented syllable as accented, showing that non native speakers' accent judgment differs from that of native speakers. They used acoustic cues for accent judgement: pitch glide, pitch height or highest intensity. Consonantal length may have also contributed in the non native accent assignment to the following (not the preceding) vowel.

These data were, obviously, very limited but were nonetheless useful to show the general tendencies in the judgment of accent in Welsh English by Malagasy listeners. An identical experiment with English words pronounced by English speakers would have been ideal to see whether those words would have been judged differently.

#### 4.6.2. Experiments in other languages.

An experiment on accent judgment in English sentences by Japanese speakers has shown that more than 70% of the Japanese subjects correctly located English sentence accent

in 17 sentences out of 25, whereas more than 85% of the native Australian English speakers who judged the same sentences accurately located accent in all the sentences (Watanabe 1988, p.184). However, given that -- as Watanabe pointed out -- the Japanese listeners tend to rely on pitch height (although it is not the one and only absolute criterion) for accent judgment, the data contained far more sentences having high falling nuclear tones (15 sentences) and therefore the proportion of 17 out 25 sentences above could have been reduced if there had been an equal number of sentences having a high fall nuclear tone and sentences not having such a nuclear tone. In the other 8 sentences which presented considerable difficulty for Japanese listeners, the native English speakers had no particular trouble judging the location of accent (Watanabe 1988, p.184).

Williams (1986, p.37-41) reported that English informants tended to hear the post accented syllable in Welsh words as the accented one, that is the syllable which contains a vowel having a pitch glide, greater envelope amplitude and longer duration. A comparison with a Welsh speaker's judgment revealed that "the trend of the English speakers' judgments is in almost exactly the opposite direction to that of the trend of Welsh judgments" (Williams 1986, p.41) because the Welsh speaker judged the syllable having shorter vowel duration, less F<sub>0</sub> change and lower envelope amplitude as the accented one. What the English

listeners heard as accented was not what the native Welsh speakers perceived as such.

The results of the two experiments afore-mentioned suggest that when non native listeners judge accent in a foreign language they base their judgment on physical prominence, and more specifically on pitch prominence.

Another experiment conducted by Fry (1972) on French listeners' judgment of the tonic accent in English word-pairs, namely the noun and verb forms of the words object, subject, digest, contract and permit revealed that French listeners use both increase in duration and increase in intensity as cues to accent judgment whereas for English listeners duration is a stronger cue than intensity (Fry 1955). However, the role played by pitch was not studied in Fry 's experiments above. Later studies carried out by Fry (1958) in English and by Rigault (1962) in French revealed that fundamental frequency was the most important physical correlate of accent as perceived by both groups of listeners, i.e. English listeners and French listeners, in their native languages.

Many other investigations in other languages have showed that fundamental frequency is the most readily perceived cue to accent judgment as, for example, those reported in Lehiste (1970).

Taking this fact into account and bearing in mind that English speakers judge the post accented ultimate syllable of English words pronounced by Malagasy speakers as

prominent, it can be inferred that what was described by non native Malagasy speakers as 'accent' in Malagasy last century is in fact prominence resulting from high pitch. Griffiths (1854, p.228) defined Malagasy accent as the "emphatic tone with which one syllable of a word is more forcibly sounded than the other, or others" and Berthier (1922, p.43) the accented syllable as "la syllabe la plus aigue du mot \_ qui est aussi la plus intense". It is this high pitch on the final syllable of English words -- such as the loan words from English mentioned in chapter 2 of this thesis -- which has been traditionally considered as accent by non native speakers, an indication that accent is in fact high tone and therefore that accent is linked with intonation.

Accent is also associated with high pitch in non native speakers' descriptions of other Austronesian languages.

#### **4.6.3. Accent in Austronesian languages.**

Accounts of other Indonesian languages -- to which Malagasy is related -- given in a short section in Brandstetter (1916) support the theory of intonation-based accent above.

The comparison of accent between modern Indo-European (hereafter IE) languages and Indonesian (hereafter IN) languages is expressed by an author as follows "Accent in the IN languages is of a different kind from what it is in

the IE. In Dutch, and particularly also in English, the principally accentuated syllable is pronounced loudly, the other syllables softly. That is not the case in the IN languages.....In the IE languages accent is stress, but in many IN languages it is a rise in pitch of the voice. It is true that this rise in pitch is accompanied by an increase in loudness, but that does not cause the unaccentuated syllables to be pronounced in a more cursory manner." (Adriani)" (in Brandstetter 1916, p.340). Adriani pointed to the fact that accent in Indonesian languages -- which results from pitch rise -- is different from accent in Indo-European languages which results from 'stress'. It is not clear what he meant by 'stress' but the statement implies that accent in Indo-European languages and in Indonesian languages are perceived differently, perhaps because accent in a language like English (and Dutch?) results from a falling pitch and great pitch range whereas it results from a pitch-rise and lesser pitch range in Indonesian languages.

Adriani (in Brandstetter 1916, p.340) went on by citing the example of one Indonesian language "...in Tontemboan the accent is produced by a rise in pitch and the accentuated syllables are all distinctly and perfectly pronounced, the Tontb. accent gives one the impression of being weak. It is, however, distinctly audible that it falls upon the penultimate" (in Brandstetter 1916, p.340).

Terms such as 'stress', 'accent' or 'intonation' are

vague and also confusing due to the fact that the reports on different Indonesian languages were made by different authors (whose names are in parentheses after the quotations cited below) who used different terms to refer to the same phenomenon, viz. accent. The following descriptions which came under the heading 'Sentence Stress' (Brandstetter 1916, pp343-344) suggest that accent is determined by tone. What is meant by sentence stress is "...the relative accentuation of the several parts of the sentence, and especially the phenomena connected with the accentuation of the end of sentence, for those are of great importance as characteristics of the IN languages." (Brandstetter 1916, p.343-344)

Javanese has accented syllables in two different parts of the sentence "Accent in Javanese consists merely in this, that the last two syllables of each subdivision of a sentence are pronounced somewhat long and slowly, but both in an equally high tone. All the other syllables of a subdivision of a sentence are pronounced in a similar tone" (Roorda)." (It is not said where in the sentence the subdivision boundaries occur).

"The end of a Sundanese sentence is always pronounced long and in a singing (zangerig) tone" (Coolsma)".

The terms 'accent' and 'intonation' are almost synonymous in the description of Minangkabau in which "the last word of a sentence, or its final syllable, bears the principal accent; thus, they say, with a stronger

intonation: 'he sleeps'= inyo lalóq" (Van der Toorn)".

In Dayak, examples are given to illustrate the fact that the interrogative sentences differ from assertive ones by the presence in the former of "an interrogative tone which somewhat accentuates, and makes half long, even the last syllables" (Hardeland)".

Other languages such as Busang are reported to have accent on the final syllable of the last word of the sentence but the relation between accent and tone is not as explicit as in the reports mentioned above.

The situation is slightly different in Achinese (/Achehnese) where "it is not the several words that are the units for the purpose of accentuation, but rather groups of two or three words, linked together as one whole." Achinese seems to have shorter intonation groups compared to the other Indonesian languages.

From a more recent description written by Shetler and Hopkins (1964) on Balangao, a Philippine minor language which also belongs to the Austronesian family, Mckaughan (1971) reported that "Balangao accent is characterised by vowel length, a slight rise in pitch and intensity....When words are combined into larger units of phrases and sentences, intonation contours tie them together. The pitches of contrastive contours either highlight or obscure the pitch component of word accent. For example, pitch rise as a feature of accent is obscured on syllables adjacent to high pitch in an intonation contour." (Mckaughan 1971,

p.158)

Another Austronesian language, Atayal, is described by Egerod (1966, p.130) in Dahl (1981, p.116) as follows "Atayal has a tendency to stress or high pitch on the last syllable." Dahl (1981, p.116) explained that apparent discrepancies in descriptions of Atayal is due to the fact that when a long vowel occurs in penultimate position in Atayal "A long penultimate vowel may be perceived as accented. But the pitch on the last syllable is much more significant".

These accounts of accent in other Austronesian languages, although short, throw light on the nature of accent in Malagasy and other Indonesian languages. Accent is associated with high tone. It appears then plausible to assume that accent is determined by intonation in those languages.

#### 4.7. Conclusion.

The acoustic analysis of syllables judged accented in Malagasy sentences have showed that acoustic parameters (intensity, duration and pitch) taken individually do not determine accent. Pitch peak was present in all accented syllables but this pitch element is a feature of Malagasy intonation rather than an acoustic correlate of accent.

Pitch as an acoustic correlate of accent is evidenced in English pronunciation of Malagasy speakers when English



accent is realized with a rise in pitch in a non final accented syllable but a rise in pitch as a feature of Malagasy intonation also occurs in the final unaccented syllable of the same word.

Non acoustic factors are involved in accent judgment. Non native speakers of a language generally perceive accent differently from the native speakers of that language, as illustrated by Japanese subjects' judgment of English sentence accent, English informants' perception of accent in Welsh words, or Malagasy listeners' accent assignment in English words spoken in Welsh-English. Non native speakers use acoustic cues for accent judgment.

## CHAPTER 5

### RELATION BETWEEN SYNTAX AND ACCENT

It has been found in previous investigations of the relation between syntax and sentence accent in some languages, for example in English, in French and in Malagasy, that a theory of accent makes appeal to syntax in one way or another. In the present chapter, I shall outline briefly how accent is said to relate or not to syntax in English and then I shall discuss in length the syntactically-based theory of accent in Malagasy.

#### 5.1. In English.

There are basically two claims, i) that accent is directly determined by syntax and ii) that accent is not determined by syntax. The two claims stem from the generative approach as introduced by Chomsky and Halle (1968).

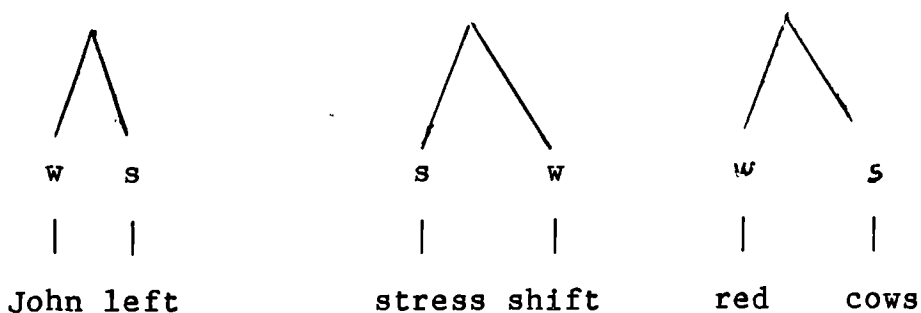
### 5.1.1. Accent determined by syntax.

In the Sound Pattern of English (hereafter SPE) by Chomsky and Halle (1968), it is claimed that different degrees of accent at phrase and sentence levels can be predicted by rules on the basis of syntactic surface structures. Sentence structures are represented in terms of phrases (with labelled bracketing NP, VP...). Accent is assigned by rules, first at word level, then at phrase level and finally at sentence level. Each lexical morpheme is assigned a stress-maximum [1 stress] by the Main Stress Rule (MSR) or by the Compound Stress Rule (CSR); then the Nuclear Stress Rule (NSR) assigns primary stress (1 stress) to the rightmost element within phrases (VP, NP) and cyclically in higher constituents (S), downgrading the other stresses to 2 stress, 3 stress and so on. There is no limit to the number of stress levels and the most prominent constituent is represented by [1 stress] (primary stress).

SPE failed to predict primary stress in examples like 'I'm going to LONdon tomorrow' where the most prominent syllable -- which is on the first syllable of London -- is not on the last lexical item of the sentence and failed to account for different accent patterns in some cases like 'George has plans to leáve' (George is planning to leave) and George has pláns to leave' (George has some plans which he intends to leave ) which were considered to be exceptions. To solve the problem with those so-called

exceptions, Bresnan (1971) suggested an 'ordering hypothesis' according to which the NSR should be ordered after all the syntactic transformations and concluded that the accent pattern in English sentences are determined by their underlying syntactic structures.

The data of the SPE was reinterpreted by Liberman and Prince (1977) who initiated the metrical tree theory. In L & P's theory, the syntactic constituents are represented by a tree diagram. Accent is relational between sister nodes, e.g. between lexical items within a compound word or a phrase or between phrases at the sentence level, and is represented in terms of strong and weak (s and w) nodes. For example,



In more complex structures, the most prominent syllable in the sentence is represented by the element dominated by s-nodes and is called the 'designated terminal element' (L & P 1977, p.259).

In each of the cases mentioned above accent pattern at phrase / sentence level is directly related to syntax. Stress rules like the NSR make appeal to syntactic

structures in terms of NP, VP or S in Chomsky and Halle (1968), or in terms of word / phrasal category in Liberman and Prince (1977).

### 5.1.2. Accent not determined by syntax.

Bolinger (1972) criticised the attempt of the SPE and of Bresnan (1971) to account for accent in terms of syntax. He gave counterexamples such as 'I have a point to émphasize' vs. 'I have a point to make' which are possible in English. He explained that the choice of verbs such as 'emphasize' or 'point' is a matter of the speaker's decision so that "the speaker adjusts the accents to suit his meaning" (Bolinger 1972, p.635) and that when the verb is highly predictable as in 'point to make', 'food to eat', 'books to write', 'work to do' and so on, it is likely to be deaccented. The same applies to nouns in, for example, 'it's a geranium plant' but 'He's a FBI plant' where the noun in the former being the more predictable element is deaccented. Bolinger (1972) argued that "the distribution of sentence accents is not determined by syntactic structures but by semantic and emotional highlighting" (Bolinger 1972, p.644). He went on to say that "Syntax is relevant indirectly in that some structures are more likely to be highlighted than others" (Bolinger 1972, p.644).

Berman and Szamosi (1972) also questioned the assignment of primary stress by the NSR either on surface or

underlying structures and presented cases similar to Bolinger's examples above, such as 'what king(s) reigned?' vs. 'what king(s) abdicated?'. According to Berman and Szamosi (1972) the verb 'reigned' is redundant (Bolinger found this term was too strong because the verb is not fully predictable from the noun) with respect to the noun and therefore is not assigned primary stress as predicted by the NSR. They concluded that "structure alone is not sufficient to determine the locus of 'normal' primary stress \_ it depends, at least to some extent, to semantics" (Berman and Szamosi 1972, p.319) but they did not formalize this dependence.

Prince (1983) and Selkirk (1984) held the view that the grid alone is sufficient to represent patterns and levels of (rhythmic) prominence in English and that the metrical tree -- as proposed by Liberman and Prince (1977) -- is superfluous. Therefore, they opted for a grid-only theory. In Selkirk's version, a metrical grid is aligned with the surface syntactic structure by two types of rules: the Text-to-Grid-Alignment (TGA) rules which align each syllable of the sentence with basic beats (i.e. beats at the bottom level of the grid) and the Grid Euphony (GE) rules which manipulates those beats by adding, moving or deleting them in order for the grid to attain an alternation of strong and weak beats, following certain principles and conditions. In the grid-only theory, the TGA rules make appeal to syllable position/ internal composition within a specific domain

(word, phrase, sentence) whereas the GE rules make appeal to the grid and the latter form the phonological rules. Thus, the claim of the metrical grid-only theory is that the phonological rules (GE rules) do not make direct reference to syntactic structures but "It is the rule of the syntax-phonology mapping, and in particular the rules for defining the rhythmic structure of the sentence, that are unalterably syntax-dependent." (Selkirk 1984, p.410). The most prominent syllable (in terms of rhythmical prominence) is represented by the highest beat on the grid. In addition, unlike the SPE and L & P who claimed that prominence is predictable on the basis on syntactic constituents, Selkirk (1984) argued that the greatest prominence (highest beat on the grid) is determined by intonation, i.e. the syllable bearing a pitch-accent must be located before applying the GE rules and such syllable must be represented as the most prominent on the grid. In her theory, intonation comes first.

It should be born in mind that accent pattern in all the theories above is based on the authors' judgments alone and it remains to be seen whether naive and native speakers' judgments would confirm the predicted accent pattern.

## 5.2. In Malagasy.

The relation between syntax and sentence accent in Malagasy was alluded to briefly by Dahl (1952) but studied more closely by Rafitoson (1980) who accounted for accent pattern at sentence level in Malagasy as dependent on syntactic structures.

The only rule posited by Dahl (1952, p.198-9) was that the subject and the predicate do not belong to the same accentual group in Malagasy. Using a syntactic analysis in terms of functions, which is based upon the structural-functional grammar of Martinet (1970), Rafitoson (1980) claims that 'accent primaire' (primary accent) has a demarcative function in Malagasy sentences, i.e. it delimits the immediate constituents of a sentence (see 5.2.2.3.below). It is that theory which is discussed in the present chapter.

In the following paragraphs I shall concentrate only on what Rafitoson calls 'accent primaire', i.e. the most prominent syllable(s) in a sentence, because of my reservation -- as well as the lack of evidence from my data -- on the existence of secondary ones.

### 5.2.1. Terminology.

Before going any further, the problem of terminology needs to be sorted out in order to avoid confusion.



#### 5.2.1.1. Stress and Accent.

Accent at sentence level is called 'accent' (de phrase) by Rafitoseon but the French term 'accent' is not to be understood as 'accent' in the sense of this word in descriptions of English prosody, i.e. prominence by pitch movement/ pitch glide (Bolinger 1958, Crystal 1969, p.120) because although Rafitoseon's primary 'accent' contains a pitch component, her secondary 'accent' does not. 'Accent primaire' refers to the greatest prominence of some syllables / vowels in a sentence and is equivalent to what some authors call sentence stress (Kingdon 1958b, Bresnan 1971) or primary stress (Chomsky and Halle 1968), or sentence accent (Bolinger 1972), or sentential stress (Berman and Szamosi 1972), or primary accent (Gimson 1980) in English. For the sake of the discussion, Rafitoseon's 'accent primaire' will be referred to as 'primary accent' in this chapter. The syllable bearing the primary accent is indicated with an accent mark " as in Rafitoseon's analysis.

#### 5.2.1.2. Syntactic terms.

The immediate constituents of a sentence -- in the sense used by Rafitoseon -- refer to their syntactic functions, i.e. Predicate, Subject and primary Expansions (which is translated as sentence adverbials below), which she also calls primary functions ('fonctions primaires').

In Phrase-structure grammar, Predicate and Subject here correspond to VP and NP respectively but, unlike the case in ~~Western~~ European languages, a 'verb' is not obligatory to form a sentence in Malagasy (see 5.2.6.2.1. below), therefore the terms Predicate and Subject will be retained here. The Predicate will be called verb-phrase (VP) only when a verb is present, and the Subject noun-phrase (NP). Predicate (/VP) and Subject (/NP) are immediate constituents or major constituents (Rafitoson's primary functions) in the following discussion.

Apart from the predicate and the subject (hereafter P and S respectively), a third immediate constituent is called 'expansions en fonction primaire' by Rafitoson. 'Expansions en fonction primaire' has been defined as "celles qui jouent le rôle d'expansion au niveau de l'énoncé lui-même et, par conséquent, ne se rattachent à aucun élément particulier de l'énoncé" (Rafitoson 1980, p.143). In the present study they are referred to as sentence adverbials (hereafter A). The notion of 'expansions' is discussed in more details in 5.2.3. below.

Another type of 'expansions' is the 'expansions en fonction non primaire' which are not linked to the sentence as a whole but to part of the sentence, i.e. to one major constituent. It is not easy to find a term which could render such 'expansions' because they sometimes refer to adverbials like <omaly> (yesterday), or prepositional phrases like <ao ambany fandriana> (under the bed) or a NP

like <hena kisoa> (pork) or the second of two conjoined elements in coordination such as <Rakoto sy ny zanany lahy> (Rakoto and his son) where <ny zanany lahy> (his son) is an 'expansion' of Rakoto (Rafitoson 1980, p.144). This second type of 'expansions' will be called noun phrase (NP), prepositional phrase (PP) or phrase adverbials (hereafter adv. to distinguish from A, i.e. sentence adverbials) depending on the context. Since the interest here is mainly in the major constituents (Predicate - Subject - Adverbial) these non primary 'expansions' will be mentioned only when relevant.

In this chapter, a vertical line | marks the boundary of a major constituent and the elements ('expansions en fonction non primaire') which are linked to it. Two of her examples are represented in this chapter as follows

(1) Tonga omaly hariva  
 (come yesterday evening)  
 | P |  
 (=came yesterday evening)

(2) Tonga teto | Rasoa | omaly hariva  
 (come here Rasoa yesterday evening)  
 P | S | A |  
 (=Rasoa came here yesterday)

## 5.2.2. Major constituents and primary accents.

### 5.2.2.1. Primary accent.

Rafitoson claimed three degrees of accent in Malagasy sentences, namely primary accent ('accent principal'), secondary accent ('accent secondaire') and unaccented syllables / vowels - ('syllabes/ voyelles inaccentuees'). Accent at sentence level is assigned by a rule similar to the English Nuclear Stress Rule, i.e. accent is first assigned to each 'accentual unit' (roughly stems and certain affixes), then primary accent is assigned to the rightmost one within each primary functions (Predicate, Subject and Adverbial), downgrading the other nonprimary accents to secondary ones. Accent has acoustic parameters: vowels or syllables bearing primary accent and secondary accent have longer duration than unaccented ones, and secondary accent ('accent de durée') is distinguished from primary accent ('accent de durée + accent de hauteur') by the presence of a pitch component on the latter (Rafitoson 1980, p.210).

The final primary accents in Rafitoson's analysis were not judged by Malagasy listeners as accented but they are nonetheless represented in the illustrations included in this chapter for the sake of the discussion.

#### 5.2.2.2. Accentual group.

A sentence is partitioned into major constituents (i.e. Predicate, Subject and Adverbials) which -- together with their 'expansions' or modifiers (if there are any) -- correspond to accentual groups, so that "Il y a autant de groupes accentuels que de segments en fonction primaire" (Rafitoson 1980, p.143). An accentual group may consist of a single accentual unit. Primary accent is assigned to the last accentual unit of an accentual group (see examples (1) and (2) above), and if the accentual group consists of a single accentual unit the latter carries primary accent (Rafitoson 1980, p.142). This implies that there is a primary accent within each accentual group and consequently, within each major constituent boundaries. Putting this in another way, there are as many accentual groups as major constituents and there are as many primary accents as accentual groups. Accentual group (hereafter AG) boundaries are represented in this chapter with the symbol [].

#### 5.2.2.3. Mapping syntax with accentuation patterns.

The relation between immediate constituents and primary accent is expressed in what she calls the demarcative function -- which other authors call 'delimitative' (Cruttenden 1986, p.18) -- of the primary accent. It consists in delimiting the major constituents

in a sentence (i.e. Predicate, Subject and Adverbials). As she puts it "La présence des accents principaux permet donc de dégager les constituents immédiats de la phrase" (Rafitoson 1980, p.213). Here are some of her examples (pp.145-146):

(1) Tonga omaly hariva  
 (come yesterday evening)  
 | P |  
 [ one accentual group ]  
 (=came yesterday evening)

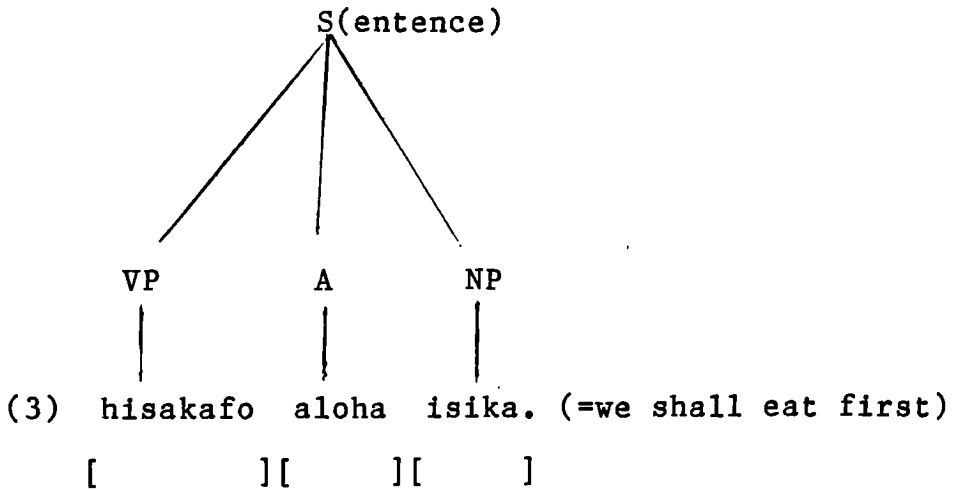
(2) Tonga teto | Rasoa | omaly hariva  
 (come here Rasoa yesterday evening)  
 | P | S | A |  
 [ 1st AG ][ 2nd AG ][ 3rd AG ]  
 (=Rasoa came here yesterday evening)

Another function of the primary accent is a distinctive one, that is to say, when two sentences have identical components "La répartition en groupes accentuels assume alors la fonction distinctive." (Rafitoson 1980, p.145). To take two of her examples:

(3) Hisakafo aloha isika. (Fr. <nous mangerons d'abord>)  
 (FUT-eat first we )  
 | P | A | S |  
 [ AG ][ AG ][ AG ]  
 (=we shall eat first)

(4) Hisakafo aloha isika. (Fr. <nous mangerons tot>)  
 (FUT-eat early we )  
 | P | S |  
 [ AG ][ AG ]  
 (=we shall eat early)

If represented with a tree-diagram, these two sentences have the following structures,







what is implied is that to each major constituent boundary corresponds a primary accent. Using the symbols above, this implies that every | (major constituent boundary) should coincide with ] (accentual group boundary) and each [] (accentual group) must contain only one " (primary accent).

I shall raise below some problems posed by such an approach. Those problems are far from being exhaustive but are pointed to in order to show the inadequacy of a syntactically -at least a functionally- based theory of accent in the case of Malagasy. Evidence against such a theory is illustrated by i) the fact that sentence adverbials can occupy different positions in the sentence resulting in different accentuation patterns of the sentence and ii) when two subjects or two predicates are connected by coordination accent patterns vary depending on the conjunction of coordination, or its position in the sentence. For the sake of simplicity, most of the examples cited below have the order Predicate-Subject (or VP - NP) which is the most common order in Malagasy sentences.

### 5.2.3. Expansions.

First, consider the case of what Rafitoson (1980) calls 'expansions'. 'Expansion' was defined by Martinet (1970, p.128) as "tout élément ajouté à un énoncé qui ne modifie pas les rapports mutuels et la fonction des éléments préexistant" and 'fonctions primaires' as "celles d'éléments

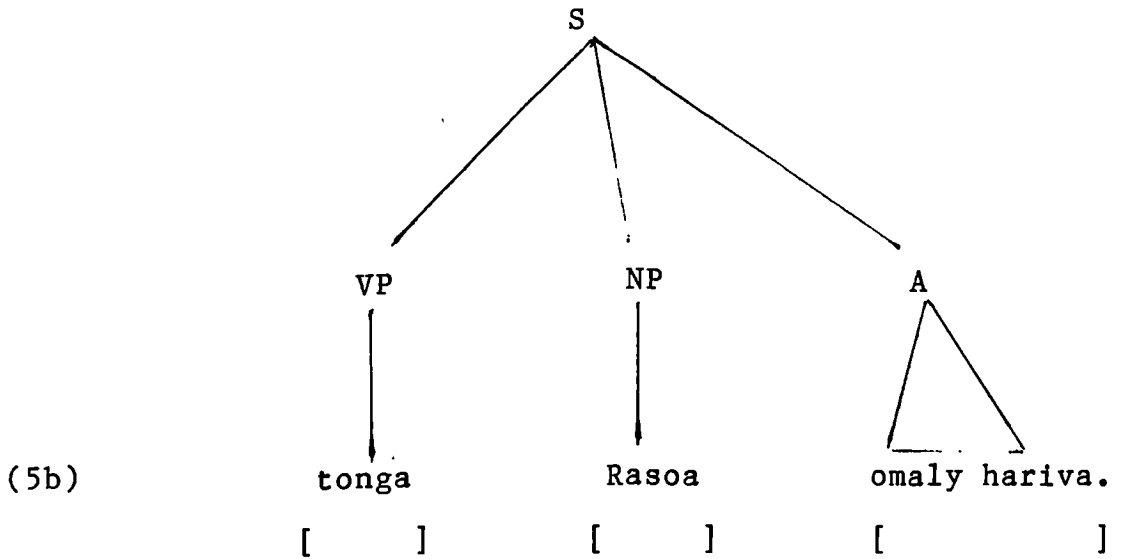
qui se rattachent directement à l'énoncé comme un tout, et non à un segment de cet énoncé" (Martinet 1970, p.118). Recall that Rafitoson distinguishes between two types of expansions, those which 'go with' the sentence ('expansion en fonction primaire') and those which 'go with' part of the sentence ('expansion en fonction non primaire'). She also emphasises elsewhere that "la même unité accentuelle [underlining is hers] est susceptible de fonctionner soit comme une expansion primaire soit comme une expansion non primaire" (Rafitoson 1980, p.145). In the following examples the expansion under consideration, namely <omaly hariva> (yesterday evening) is an adverbial. Consider two of her examples:

	"	"		"	"
(5) a)	tonga	omaly	hariva	Rasoa	
	(came	yesterday	evening	Rasoa)	
	P			S	
	[			][	]

	"	"	"		"
b)	tonga (teto)	Rasoa	omaly	hariva	
	(came (here)	Rasoa	yesterday	evening)	
	P	S	A		
	[	][	][		]

To facilitate the comparison, I have added the subject <Rasoa> in (5a) and omitted <teto> (here) in (5b) from





According to Martinet's definition, the phrase <omaly hariva> would be an expansion in both (5a) and (5b) because its presence or absence does not modify the relation between <tonga> (came) and <Rasoa> which remain a Predicate (VP) and a Subject (NP) respectively in each case.

In Rafitoson's analysis, <omaly hariva> in (5a) is linked to the Predicate <tonga> and therefore belongs to the same accentual group as the Predicate, whereas in (5b) <omaly hariva> is a sentence adverbial and therefore constitute one independent accentual group. This leads to a difference in the structures of the two sentences and, consequently, in their accentual patterns, i.e. there are two accentual groups in (5a) but three in (5b). Each accentual group containing a primary accent, (5a) has two primary accents and (5b) three.

Semantically, no reference has been made by Rafitoson as to how those two sentences differ but, in my opinion,

they are identical, i.e. whether <omaly hariva> is put before the subject -- as in (5a) -- or after it -- as in (5b) --, the meaning of the two sentences is the same (Rasoa arrived yesterday evening). If that is the case, then <omaly hariva> has the same function in both sentences, that is to say it is either a sentence adverbial in both or a phrase adverbial in both, in which case the difference in the accentuation patterns of those two sentences is determined by the ORDER of its elements and not by the number of major constituents. The following points prove that such is the case.

In his description of Malagasy sentence structures, and following the structural-functional approach, Rajaona (1972, p.96-97) -- also inspired by Martinet -- distinguishes between two types of adverbials (which he called 'expansions du predicat') that he referred to as 'compléments non autonomes' and 'compléments autonomes' which are roughly the equivalents of Rafitoson's 'expansions en fonction non primaire' and 'expansions en fonction primaire' respectively (the difference being that Rajaona's definition of a 'complément' is in its relation to the predicate whereas that of Rafitoson's 'expansion' is in its relation to the sentence as a whole, see 5.2.6.1. below). I will call the 'compléments autonomes' sentence adverbials and the 'compléments non autonomes' phrase adverbials. Rajaona's phrase adverbials have a fixed position in the sentence, e.g. after the predicate, whereas the sentence adverbials

can occupy different positions in the sentence, e.g. before or after the subject, but retain their status of major constituents whatever their position for "Quelles que soit la place de ces éléments autonomes dans l'énoncé, dans les limites imposées par les éléments non autonomes, la validité syntaxique de l'énoncé n'est jamais mise en cause: le changement de position de ces éléments n'a de repercussion que sur l'organisation stylistique de la phrase." (Rajaona 1972, p.97). However, the freedom of the 'compléments autonomes' to occupy certain positions is restricted in some cases which I will not go into details here.

Thus, according to Rajaona (1972), <omaly hariva> (yesterday evening) in 5a and in 5b would be a sentence adverbial ('complément autonome'), i.e. an element which can occupy different positions in the sentence without changing the meaning of the latter and which retains its status of major constituent whatever its position in the sentence. Similar examples with <omaly> (yesterday) are given by Rajaona (1972, p.97-98) and by Dez (1980, p.139). Furthermore, in one example given by Martinet (1970, p.108-109) the French equivalent of <omaly>, namely 'hier' (yesterday) is also a 'monème autonome' and Martinet (1970, p.109) added that "la nature du rapport d'un monème autonome avec le reste de l'énoncé ne dépend pas de sa place dans cet énoncé."

These confirm the fact that whether <omaly hariva> is placed between the subject and the predicate or after the

subject, the sentence has the same meaning but two different orders of the major constituents. Therefore, <omaly hariva> is a sentence adverbial in (5a) as it is in (5b) so that each of those two sentences has three major constituents in two different orders:

(5')	a)	tonga	omaly	hariva	Rasoa
		(arrived	yesterday	evening	Rasoa)
		P	A	S	
		[	]	[	]

b)	tonga	Rasoa	omaly	hariva
	P	S	A	
	[	]	]	]

Moreover, in example (3) above, Rafitoson (1980, p.145) stated that <aloha> is a primary expansion (sentence adverbial) and therefore can be placed in a different position as in

(3')	Hisakafo	isika	aloha.
	P	S	A
	[	]	]

while retaining its primary function and without changing the meaning of the sentence. If ability to change position in the sentence is a characteristic of sentence adverbials, then it confirms the fact that <omaly hariva> is one in (5a). It also confirms the fact that a sentence adverbial such as <omaly> can be placed after the predicate as in 5a) -- in the same way as <aloha> can be positioned after the predicate in (3') -- or after the subject as in (5b) and (3').

If -- as Rafitoson claims -- primary accent delimits the immediate constituents, then a major constituent boundary (|) should coincide with an accentual group boundary (]). Such is the case in (5'b) but not in (5'a). This contradicts the claim that there are as many primary accents as major constituents.



#### 5.2.4. Word-order.

In Malagasy, certain elements, like sentence adverbials, can move to a different position in a sentence without altering its meaning. Such elements often refer to time or place (Rajaona 1972, p.97; Dez 1980, p.139; Keenan 1978, p.270) but also to aim, manner or frequency, as in the pairs of sentences below which have the same structure as (5) and (6) above, i.e with the predicate in initial position and the elements under consideration (underlined in the text) placed before the subject -- in a) -- or after it -- in b). The two sentences in each pair are semantically identical but have different word-orders.

##### 5.2.4.1. Time.

(7) a) Hiainga amin'ny telo ny fiaramanidina.  
P | A | S |

b) Hiainga ny fiaramanidina amin'ny telo.  
P | S | A |

(FUT-take off DET. plane PREP. DET. three)

(=The plane will take off at three o'clock)

(8) a) Feno dimy taona androany i Zo.

P | A | S |

b) Feno dimy taona i Zo androany.

P | S | A |

(full five years DET Zo today )

(=Zo is five today)

(9) a) Tsy niasa nandritra ny tapa-bolana Razafy.

P | A | S |

b) Tsy niasa Razafy nandritra ny tapa-bolana.

P | S | A

(NEG.work Razafy for DET.fortnight )

(=Razafy did not go to work for a fortnight)

#### 5.2.4.2. Place.

(10) a) Zatra ny fiainana miadana tany am-pita izy.

P | A | S |

b) Zatra ny fiainana miadana izy tany am-pita.

P | S | A |

(used to DET. life comfortable he LOC.abroad )  
(=he was used to the comfortable life abroad)

(11) a) Lasa nankany ambanivohitra ry zareo.  
P | A | S |

b) Lasa ry zareo nankany ambanivohitra.  
P | S | A |  
(gone DET. they LOC. countryside )  
(=they have gone to the countryside )

(12) a) Efa nifankahita tany an-tsena izahay.  
P | A | S |

b) Efa nifankahita izahay tany an-tsena.  
P | S | A |  
(already PAST.meet we LOC. market)  
(=We have already met each other on the market place)

#### 5.2.4.3. Frequency.

(16) a) Mananatra ny zafikeliny mandrakariva i Dadabe.  
P | A | S |

b) <sup>"</sup> Mandrakariva <sup>"</sup> i <sup>"</sup> Dadabe mananatra ny zafikeliny.

A | S | P |

c) Mananatra <sup>"</sup> ny zafikeliny <sup>"</sup> i Dadabe <sup>"</sup> mandrakariva

P | S | A |

(PRES.admonish DET.grandchildren-his Grandpa constantly)

(=Grandpa constantly admonishes his grandchildren)

(17) a) Mantsaka <sup>"</sup> isa-maraina <sup>"</sup> i Lala.

P | A | S |

b) Mantsaka <sup>"</sup> i Lala <sup>"</sup> isa-maraina.

P | S | A |

c) <sup>"</sup> Isa-maraina <sup>"</sup> i <sup>"</sup> Lala <sup>"</sup> mantsaka.

A | S | P |

(every morning DET. Lala PRES.fetch water)

(=Lala fetches water every morning)

(18) a) Tara <sup>"</sup> matetika <sup>"</sup> izy.

P | A | S |

" " "  
b) Tara izy matetika.

P | S | A |

" " "  
c) Matetika izy tara.

A | S | P |

(often he late)

(He is often late)

#### 5.2.4.4. Aim .

Such elements can also be subordinate clauses expressing an aim as in

" "  
(13) a) Tonga hisambotra ny mpanakorontana ny polisy.

P | sub.cl. | S |

" " "  
b) Tonga ny polisy hisambotra ny mpanakorontana .

P | S | sub.cl. |

(come DET.police FUT.catch DET. trouble-makers)

(=the police has come to catch the trouble makers).

" "  
(14) a) Mihomankomana handray ny vahiny ny olona.

P | sub.cl. | S |

"                      "                                      "

b) Mihomankomana ny olona handray ny vahiny.

P                      |              S                      |              sub.cl.                      |

(PRES-prepare      DET.people      FUT.receive      DET. visitors)

(=People make preparations to receive the visitors).

"    "

(15) a) Miezaka mba hanarina ny toe-karena ny fanjakana.

P                      |                      sub.cl                      |              S                      |

"                                      "                                      "

b) Miezaka ny fanjakana mba hanarina ny toe-karena.

P                      |              S                      |              sub.cl.                      |

(PRES.try      DET. authorities      FUT-restore      DET. economy)

(=the authorities make efforts to restore the economy).

Opinions differ as to whether sequences such as those underlined in (13)-(15) above should be regarded as modifiers of the predicate or as subordinate clauses; here I follow Dez (1980, p.105-106) who considers them as subordinate clauses. See Rajaona (1972, p.540-542) for a different opinion.

It follows that sentences constructed in the same way as (5)-(18) above have at least two possible surface syntactic structures and two possible accentual patterns, depending on the constituents order.

The accentual pattern of the sentence depends not only



- f)  $\begin{matrix} \text{"} & \text{"} & & & \text{"} \\ (2) & (5) & (4) & (1) & (3) \\ \text{A} & | & \text{S} & | & \text{A} & | & \text{P} & | & \text{A} & | \end{matrix}$
- g)  $\begin{matrix} \text{"} & \text{"} & \text{"} & & \text{"} \\ (1) & (5) & (4) & (2) & (3) \\ \text{P} & | & \text{S} & | & \text{A} & | & \text{A} & | & \text{A} & | \end{matrix}$
- h)  $\begin{matrix} \text{"} & & & \text{"} & \text{"} \\ (5) & (1) & (2) & (3) & (4) \\ \text{S} & | & \text{P} & | & \text{A} & | & \text{A} & | & \text{A} & | \end{matrix}$

Thus, sentence (19) has at least eight possible word order (19a-h) and at least three accentual patterns, namely with two primary accents as in a), or with three as in b) c) e) and h), or with four as in d) f) and g). Again, this is evidence that primary accents do NOT delimit major constituents or vice-versa.

The examples above show that, as far as the relation between accentual pattern and syntactic functions is concerned, the accentual pattern is not determined by the number of syntactic functions. The accentual pattern of a sentence containing Adverbials can be modified, depending on the position occupied by such elements and their number.

Another area in which major constituent boundary does not correspond with primary accent is when two major constituents (e.g. two subjects or two predicates) are connected by coordinators.





However, if the coordination <sy> (and) is substituted by <na> (or),

"		"		"
(19) Ho any Toamasina		izaho na ny anadahiko.		
P		S		

(=I or my brother will go to Toamasina)

both <izaho> and <anadahiko> carry a primary accent. Supposing that <ny anadahiko> is an expansion of the subject by coordination then there will be two primary accents within the boundaries of one major constituent -namely the subject- in (19), which contradicts the demarcative function of primary accent mentioned above (5.2.2.1).

On the other hand, Dez (1980, p.143) stated that <sy> connects two or more constituents having the same function. Supposing that <izaho> and <ny anadahiko> are two subjects conjoined by <sy>,

"		"		"
(19')Ho any Toamasina		izaho sy ny anadahiko.		
P		S		S

then, in (19') <izaho> is a primary function (major constituent) but does not carry primary accent. (Coordination in the case of reciprocals, as in <mifankatia i Dada sy i Neny> (Dad and Mum love each other), is excluded here because they are of a different nature). Clearly,

major constituent boundaries do not correspond to primary accents.

#### 5.2.5.2. Predicates.

In the following set of examples (20)-(23), two predicates are connected by the coordinator <sy> (and):

(20) Manasa sy mipasoka Rasoa.  
       P       |       P       |       S       |  
      (wash    and   iron        Rasoa)  
      (Rasoa washes and irons clothes.)

(21) Ho any an-tsenana sy ho any amin'ny banky aho.  
       P               |       P               |       S       |  
      (LOC.        market and LOC.   PREP.DET.bank I )  
      (=I am going to the market and to the bank)

(22) Lehibe sy mahagaga ny asan'Andriamanitra.  
       P       |       P       |       S               |  
      (great   and wonderful DET work-of God )  
      (=God's work is great and wonderful)



" " "  
(21')Sady ho any an-tsenana no ho any amin'ny banky aho.

" " "  
(22')Sady lehibe no mahagaga ny asan'Andriamanitra.

" " "  
(23')Sady mpihira no mpamoron-kira izy.

In (20')-(23'), which are equivalent in meaning to (20)-(23), there are three primary accents (as indicated by the accent marks) but (20)-(23) have only two. Consequently, in the case of coordination in Malagasy as illustrated by the examples above, if <sy> is used there are two primary accents, if <sady> is used in initial position there are three primary accents. These are also evidence that the primary accent do not delimit the major syntactic constituents.

#### 5.2.6. Malagasy sentence structures.

##### 5.2.6.1. Problem of definition.

One of the problems with the model proposed by Rafitoson is the notion of 'primary function' on which her

definition has been based. Primary functions were defined by Martinet (1970, p.118) -- see definitions in 5.2.3. above -- in the relation of an element to the sentence, with reference to French sentence structures. Rajaona (1972, p.85) adopted -- with specific reference to Malagasy sentence structures -- the term 'complément primaire' (which is also based on Martinet's notion above) on the bases of two criteria: "rapport direct avec le prédicat et aptitude, par reversion, à la fonction de sujet". Notice that his definition differs from Martinet's in two ways, i) in Martinet's -- and Rafitoson's -- definition 'primary function' is in relation to the sentence as a whole (and not to a major constituent) whereas Rajaona's 'complément primaire' is in relation to the predicate (a major constituent) and ii) the 'complément primaire' should be able to become a subject with a reversion of the order Predicate-Subject into Subject-Predicate. To take examples 5a and 5b above which are repeated here:

(5') a) Tonga omaly hariva Raso.

P | A | S |

b) Tonga Raso omaly hariva.

P | S | A |

the sentence adverbial <omaly hariva> in (6a) and (6b) can become the subject as in

(5') c) Omaly hariva no nahatongavan-dRaso.

S                    |    P                                    |  
(lit.yesterday evening was arrived of Raso)  
(=it's yesterday evening that Raso came)

This results in the change of the form of the verb by affixation of the stem <tonga> with <n-aha-.....-ana> with an insertion of <-v-> and a deletion of the final vowel of the discontinuous affix. This ability of Adverbials to take the function of the subject which is characteristic of Malagasy is not found in languages such as French or English.

John arrived yesterday. --> \* Yesterday arrived of John.

Jean est arrive hier. --> \* Hier est arrive de Jean.

As a result, Rajaona's definition gives a better understanding of the structure of the Malagasy sentences illustrated above. So, the definition of 'expansions en fonction primaire' -- which may suit the structure of French sentences -- is not appropriate for Malagasy sentence structures.

I have used the notion of sentence vs. phrase 'adverbials' but it does not mean that the use of such a notion will be without problem in Malagasy. The term

'adverbial' is used here because it is more familiar in English and in order to facilitate the discussion. Obviously, Malagasy requires new notions which would be appropriate to its own syntax.

#### 5.2.6.2.Problem of syntactic approach.

It may be argued that the syntactic analysis in terms of functions does not suit the description of the relation between syntax and prosody. In other words, a different approach to syntax may give a better correlation between syntax and primary accent in Malagasy than, for example, in terms of constituent-structure as illustrated in some cases above, or than in terms of phrase-structure. Such approaches have been based mostly on ~~Western~~ European languages and if they were to be applied for describing the sentence structures in Malagasy, then some modifications would no doubt be necessary in the first place and problems are anticipated. I briefly raise below some points which are likely to present such problems in the case of Malagasy.

##### 5.2.6.2.1.Verb.

For example, if -- as claimed by phrase-structure grammar -- a sentence consists of Noun Phrase + Verb Phrase, then it would not apply to Malagasy because a



'verb' is not essential to form a sentence in Malagasy as the following examples show:

(24) Mafana androany.

(hot today = it is hot today)

(25) Ao ny tale.

(LOC DET boss = the boss is there)

(26) Telo ny zanany.

(three DET children-her = she has/had three children)

(27) Herintaona i Fetra.

(one year DET Fetra = Fetra is/was one year old)

(28) Rahampitso ny fanadinana.

(tomorrow DET exam = the exam will be tomorrow)

(29) Tapitra ny tantara.

(end DET story = the story ends/ ended)

'Verb' is defined as an element which can display morphological contrasts of tense, aspect, voice, mood, person and number (Crystal 1985). In Malagasy, adjectives, nouns and locative markers can display morphological contrasts of tense, as in

Mafana androany.	vs.	Nafana omaly.
(hot today )		(hot yesterday)
(=it's hot today )		(=it was hot yesterday)

Ao ny tale.	vs.	Tao ny tale.
(LOC DET. boss)		(LOC. DET. boss)
(=the boss is there)		(=the boss was there)

Mpampianatra izy.	vs.	Ho mpampianatra izy.
(teacher he )		( teacher he )
(=he is/was a teacher)		(=he will be a teacher)

In the literature dealing with syntactic typology (Keenan 1976, 1978, Hawkins 1983), Malagasy is often mentioned as one of the rare languages having the order V(erb) O(bject) S(ubject). It is worth noting that this order applies only when the element 'verb' is present for an unlimited number of 'verbless' sentences such as (24)-(29) above can be constructed in Malagasy. However, the category 'verb' exists in Malagasy and Rajaona (1972, p.700) listed specific morphemes which can account for a Malagasy 'verb'.

#### 5.2.6.2.2. Phrases vs. sentences.

Generative grammar claims that sentences are hierarchically structured into words and phrases and a set



(teacher Maths Rakoto = Rakoto is a Maths teacher)

That is to say, both the sentence (30) and the phrase (31) have identical structures. Thus, in Malagasy, the following structures are possible

S --> N + N

NP --> N + N

Also in

(33)           "           "  
Ny ankizy maditra  
(the children naughty = the children are naughty)

(34)           "  
Ny ankizy maditra  
(the children naughty= the naughty children)

the constituents are identical. Both (33) and (34) have three elements belonging to three categories: a determiner <ny> (the), a noun <ankizy> (children) and an 'adjective' <maditra> but (33) is a sentence whereas (34) is a phrase. Thus

S --> NP + Adj(ective)

NP --> NP + Adj(ective)

In neither case is accentuation determined by the constituent structure but the difference in accentuation pattern between (30) and (31) and between (33) and (34) suggests that prosody distinguishes the phrase from the sentence. This will be dealt with in the next chapter.

### 5.3. Conclusion.

As far as the relation between syntax and accent in Malagasy is concerned, accent at sentence level cannot be assigned on the basis of syntactic structures. The accentuation pattern of a sentence varies according to different factors such as the presence of sentence adverbials, their position, the linear order of the immediate constituents and so on.

Evidence has been given from the analysis of Malagasy sentences containing such adverbials and cases of coordination of two major constituents. It was found that sentence accent does not determine immediate constituents or vice-versa.

Malagasy sentence structures being different from Western European languages such as English and French, for example in the possibility of forming Malagasy sentences without verbs or in the ability of sentence adverbials to become a subject and to occupy different positions / functions in the sentence, its syntactic analysis probably requires a different approach from what has been / is being used for

the analyses of those languages.

It is not my intention to present a new theory of syntactic analysis for Malagasy because it is beyond my competence. Instead, I would like to attempt a different theory of accent in Malagasy, that is in relation to intonation, which will be the object of the next chapter.

## CHAPTER 6

### INTONATION AND ACCENT

There are two approaches to the analysis of the relation between accent and intonation. In the first approach, the accentuation pattern of a sentence is determined independently and the intonation pattern is superimposed on it (Chomsky and Halle 1968). With the second approach the intonation pattern of the sentence determines its accentuation pattern (Selkirk 1984). Having shown in the previous chapter the failure of the first approach to account for accentuation pattern in Malagasy sentences, in this chapter I take the second view and I will show that the accentuation pattern of Malagasy sentences is better accounted for with an intonation-based approach.

#### 6.1. Definition of intonation.

The term 'intonation' has been used by linguists for a long period of time without being given a formal definition. It is only with the recent studies on prosodic systems that the need for definitions (including that of intonation) has been felt. A historical review of how this term -- originally referring to the melody of a song -- has become

an expression for sentence melody in linguistics is given in Rossi et al (1981, p.1-15).

Some authors, like Kingdon, confined their study of intonation to that of pitch patterns for intonation is "the variations given to the pitch of the voice in speaking" (Kingdon 1958a, p.1). For others, like Crystal, pitch movements (i.e. tone and pitch-range), although central to the study of intonation, constitute only part of it for "intonation is viewed, not as a single system of contours, levels, etc., but as a complex of features from different prosodic systems." (Crystal 1969, p.195). He goes on to say that "These vary in their relevance, but the most central are tone, pitch-range and loudness with rhythmicality and tempo closely related." (Crystal 1969, p.195)

As Crystal pointed out -- and I agree with him -- the first definition above becomes inaccurate when it comes to study the meanings of intonation because effects -- such as grammatical or attitudinal -- which are usually attributed to intonation are not produced by pitch alone. In a pilot experiment conducted prior to the present study, my comparison of Malagasy sentences read with 'attitude' (e.g. of joy, anger, disgust, pride, admiration) and the same sentences read without 'attitude' (by the same speaker) confirmed this fact. Sentences spoken with 'attitude' were physically characterised by greater pitch range or longer duration or greater amplitude of waveforms or a combination



of two or three of those physical parameters. However, very little is known at present on Malagasy prosodic systems and therefore, the study of intonation in this chapter refers to the study of pitch patterns.

To give a comprehensive study of Malagasy intonation patterns would be beyond the scope of the present study and therefore it is confined to declarative sentences having neutral intonation.

I begin by giving reasons for advancing the hypothesis of an intonation-based approach to accent in Malagasy.

## 6.2. Role of intonation in perceived accent.

Previous investigations on sentence accent in Malagasy have shown the role played by intonation. Dahl (1952, p.198) remarked that "l'accent principal a une intonation plus élevée que les accents secondaires", which is echoed by Rakotofiringa (1978, p.318) "...en malgache, la hauteur joue un rôle plus important que les autres paramètres dans la réalisation de l'accent" and by Rafitoson (1980, p.210) "...c'est la hauteur musicale, et elle seule, qui est responsable du support de force de l'accent principal." It is worth noting that Dahl and Rafitoson found different acoustic parameters for accent in Malagasy, namely intensity and duration respectively, but both of them agree that the high tone distinguishes the primary accent from the secondary ones within accentual groups. Both of them also

adopted a syntax-based theory of sentence accent, which is reported in 6.6.2. below.

In chapter 4 I have shown that, given the percentage judgment scores and the measurements of acoustic parameters (intensity, duration and pitch) for each (phonetic) syllable nucleus of each sentence, scatter plots of percentage scores against acoustic measurements showed that the highest score corresponds to a high pitch in most cases, i.e. that the prominent syllable (i.e. the syllable judged as accented by the informants) is always associated with a Fo peak even when there was a low correlation between scores of perceived accent and Fo values.

It has also been shown in experiment 5 that when a Malagasy speaker 'stresses' the initial syllable of a multisyllable loan word the high tone still occurs on the ultimate syllable which is traditionally considered as 'accented', proving that the high tone is determined by intonation and not by what the informants regarded as 'accent'.

For the purpose of the present study, a model of representation of Malagasy intonation is needed. In order to build up such a model, the phonetic representation and the mental representation of such sentences are described first.

### 6.3. Data.

Illustrations in this chapter have been taken from 4 types of discourse, namely contextless declarative sentences said in isolation, monologues, dialogues and news broadcast.

The first type is constituted by the data of experiment 4. They were minimal pairs of sentences translated orally from French into Malagasy and said out of context. Their intonation can be described as that of what is usually referred to as declarative 'neutral' sentences or of sentences in citation form.

The monologues are 3-5 minutes recordings of 4 speakers (2 female and 2 male) who were students in Britain at the time of the present study and who spoke on a topic of their own choice. They all spoke about their stay abroad. Two other monologues were recorded: one was part of an interview on Radio Madagascar with one of the most famous Malagasy (male) poets who spoke on the topic of some Malagasy school children's interest in composing poems; the other was another male speaker recalling his childhood. Both of them spoke with enthusiasm and a wide pitch range.

The dialogues are between the present investigator and 4 Malagasy students in Toulouse, France. Since I had met them only the day before the recording and for about 20 minutes (on a bus journey), very little information about each other had been said during that time, so the questions and answers in the dialogues were natural (i.e. not

simulated). Questions such as where do you live in Madagascar? Where are you studying? What are you studying? Who sponsors you? and so on were asked and answered from both sides. The recordings were done in a recording studio of the University of Toulouse and one informant at a time talked with the investigator.

The news items were recordings from news bulletins on Radio Madagascar read by two different male speakers.

#### 6.4. Malagasy intonation.

##### 6.4.1. Phonetic description.

Since pitch patterns are central to the study of intonation, the obvious place to start the analysis of intonation is to look at the Fo contours.

It is known that a number of factors influence Fo traces, such as segmental variations (intrinsic Fo of vowels, manner of articulation of consonants), speaker's sex (male or female), speaker's attitude, lexical and/or grammatical accent realizations, pathological voice features (short term/ long term), style, and so on. Those factors are classified in various ways (Rossi et al. 1981, p.22-24, Jassem and Demenko 1986, p.6-7). Consequently, Fo peaks can be determined by different variables.

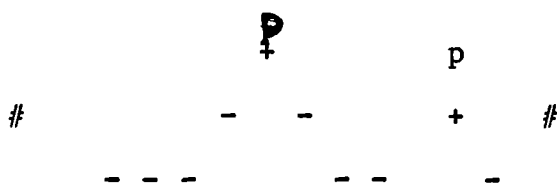
The problem in phonetic analyses -- including that of Fo contours -- is expressed in the following statement by

Jassem and Demenko (1986, p.5) that "there is still no methodology, much less an algorithm, that would enable raw acoustic-phonetic data to be interpreted linguistically" (p.5).

I have compared sentences sharing common factors (syntactic structure, approximate number of syllables, neutral intonation) as spoken by different speakers -- to reduce idiosyncratic variations -- and in different types of discourse as described above in order to find a recurrent pattern of Fo traces in Malagasy.

#### 6.4.1..1.Short declarative sentences.

The recurrent Fo patterns in the Malagasy short declarative sentences in experiment 4 can be represented as follows



In this representation dashes symbolise syllables, the + Fo peaks, and ## the sentence boundaries. The distance between the two peaks and the number of syllables vary from one sentence to another.

What is characteristic in this phonetic representation

is that Fo has at least two peaks: one in non-final position in the sentence (P) and one in final position (p); the latter being in general relatively lower than the former. The Fo peaks represented here are those which consistently occur despite speakers variations and segmental variations.

It is worth noting that this pattern is characteristic of complete sentences, not of smaller syntactic units. Syntactically, the sentences are composed of a Noun Phrase and a Verb Phrase (NP + VP) but since a verb is not obligatory in other Malagasy sentences analysed later on in this chapter, 'sentence' here is understood in the traditional definition of Predicate + Subject, which has hitherto been used in Malagasy syntactic descriptions. The Predicate will be referred to as VP when it does contain a verb, and the Subject as NP.

However, this pattern cannot be said to be representative of Malagasy declarative sentences unless it persists in spontaneous speech.

#### 6.4.1.2. Sentences in spontaneous speech.

In monologues, interviews and news items, sentences are much longer than the data described in 6.4.1.1. above. They can contain up to 8 or 9 Fo peaks but they are broken up by internal pauses, in which case a downdrift of Fo peaks is sometimes observed between internal pauses but this depends on the number of syllables which intervene between



Fig. 9. 'nefa rehefa nifanaraka tsara...'  
spoken by a male speaker.

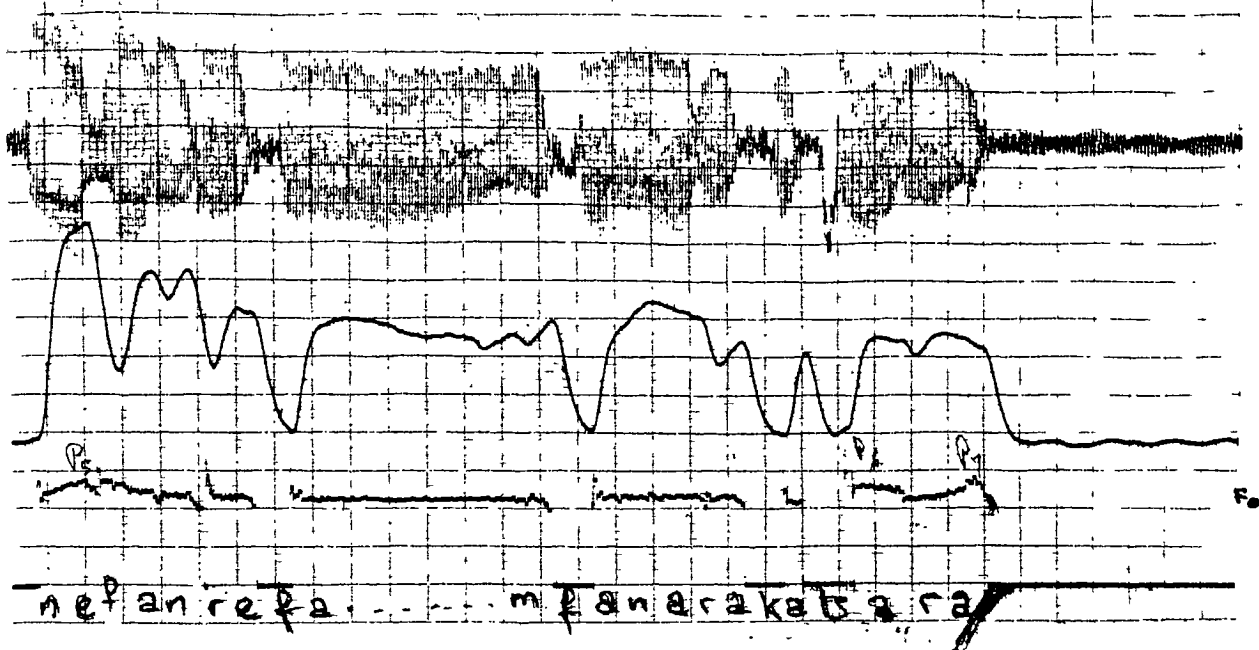
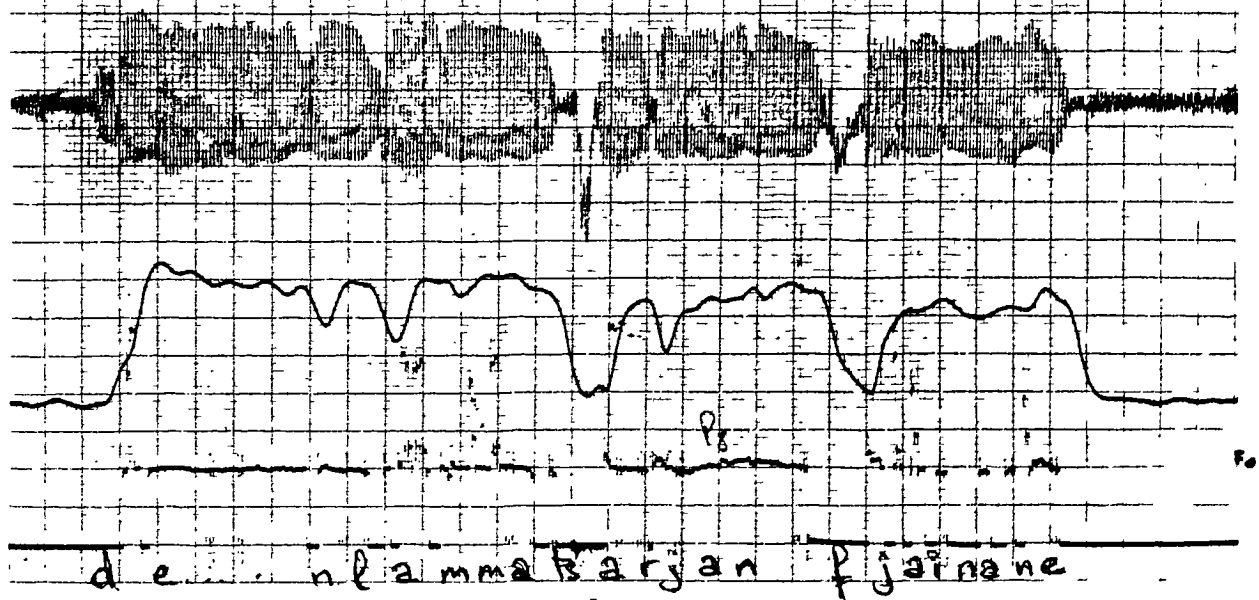


Fig. 10. '...dia nilamina tsara ihany ny tsainany'  
(end of sentence above)

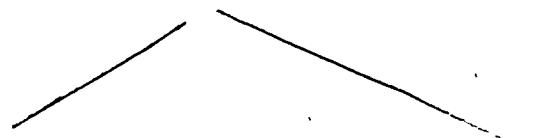




#### 6.4.2. Mental representation.

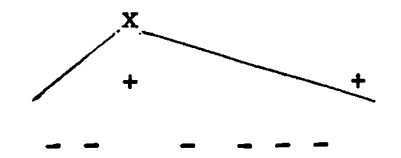
In experiment 2 where the informants were asked to tell the difference between pairs of sentences which have identical segments but different prosodic patterns, they made statements which reflected their mental representation. They would say that the difference between, e.g. 1a and 1b, is that the 'sentence', or the 'voice', or the 'accent', or the 'tone' or the 'intonation' ascends (Mlg <miakatra>) on [te] in 1a but on [mba] in 1b then descends (Mlg <midina>), and this is often accompanied by drawing an ascending and then descending imaginary line with a hand or with a finger.

Such patterns are not uncommon in Malagasy people's mental representations. For example, when Malagasy children learn to read, they read a sentence syllable by syllable on the same tone [ma-mbu-li-va-ri-ni-re-ni-ni-la-la] <Mamboly vary ny renin'i Lala> (Lala's mother is planting rice), which teachers or parents concerned for fluent reading will correct by raising the intonation on [va] and this is often accompanied by an ascending gesture of the hand up to [va] then descending till the end of the sentence. It is also illustrated by Domenichini-Ramiaramanana (1977, p.67) in the following example where the lines represent the melody ('courbe mélodique') of the sentence:



Mihinana ny trondronay.  
(PRES.bite the fish- our)  
(=our fish are biting)

The results of experiment 4 revealed that the pivot -- that is, the point where the ascending direction (in the mental representation) changes into a descending one -- corresponds to the non-final Fo peak, as in



[manambadukteraratef]

and this, in turn, corresponds to the perceived accent which is represented with an asterisk (\*) in the remainder of this chapter.

#### 6.4.3. Abstract representation.

Intonation has been represented mostly either in terms of physical (pitch) patterns or of perceptual patterns. As Ladd and Cutler (1983, p.1) put it "On one side of the dichotomy stand instrumental and experimental studies that seek to quantify acoustic features and investigate

perceptual responses. On the other are descriptive and theoretical studies of prosodic structure and its relation to other aspects of grammar and phonology."

For example, the significant levels of intonation pioneered by American analysts (Pike 1945, Trager and Smith 1951) and based on the authors' perception, were contradicted by experiments conducted by Bolinger (1951) who claimed that "the configuration continuum is what counts, not a particular sequence of levels." (Bolinger 1951). The level approach was also applied to analyses of intonation of other languages such as French (Delattre 1966), Spanish (Stockwell et al 1956) and Malagasy (Rafitoson 1980) but as far as accent judgment was concerned, the authors -- linguistically trained speakers -- were the sole judges in most cases.

On the other hand, the tonetic analysis of intonation in the British tradition (Palmer 1933, Kingdon 1958, Halliday 1967) gives much importance to phonetic details distinguished between high-level, high-fall and high-rise nuclear tones. However, in Quirk and Crystal's (1966) experiment where English speakers were asked to repeat a sentence the same way as they heard it, this distinction was not always made, from which Crystal (1969, p.216) inferred that "there is evidence of a close relation between [ˆ] and [˘] or [˘] in Quirk and Crystal (1966)". Moreover, in that experiment, pitch configuration which was central to the tonetic approach was not proved to be the most important

because it was found that "the most readily perceivable, recurrent, maximal functional unit to which linguistic meanings can be attached (in the present state of our knowledge) is the tone-unit" (Crystal 1969, p.204).

An adequate abstract representation of intonation should be able to capture both the phonetic level and the perceptual level. By taking into account the physical pattern and the mental representation of short Malagasy declarative sentences -- like the ones found in experiment 4 -- the following abstract representation is given:

\*

Manambady Dokotera Ratefy.  
(married Doctor Ratefy)

in which the asterisk (\*) indicates the syllable which has physical prominence (high tone) AND which is perceived as prominent (it was shown in chapter 4 that a high tone is not perceived as prominent if it is in final position in the sentence).

Perceived accent refers to that of the syllables which were judged as accented by the majority of informants in experiment 4 whenever sentences from that data are cited in this chapter. As for the other sentences which are used as illustrations in this chapter, they reflect the present author's judgements as inferred from the results of experiment 4. It was found in that experiment that a non

final high tone is a characteristic of prominent syllables and this will be taken as the basis for accentuation pattern in the examples which follow. This means, of course, that the accentuation pattern of the following examples reflects the judgment of a linguistically trained subject and that it will need to be tested. Informants' judgments during a pilot study will be occasionally mentioned.

The notion of intonation-group is introduced here. Sentences are divided into intonation groups. Each intonation-group contains a prominent syllable marked with \* except the one in final position in a neutral (declarative) sentence. An intonation group boundary occurs after the last syllable which belongs to the word which carries the prominent syllable. Boundaries across intonation-groups are marked with /. The question of how a sentence is partitioned into intonation-groups will be studied later on in this chapter.

Another term introduced here is 'utterance'. Utterance has been defined in Roach (1983, p.114) as "a continuous piece of speech beginning and ending with a clear pause." Thus, an utterance can be a monosyllabic word, a phrase, a sentence or a sequence of sentences. However, since it has been observed earlier in the case of long sentences, that a pause can occur internally, (i.e. before the expression of an idea or of a topic is completed), the end of an utterance here refers to the one which occurs at the boundary of the final intonation-group (i.e. at // in the transcription).



\*

( ) Omaly hariva / no nahatongavan-dRaso //

(It was yesterday evening that Raso arrived)

\*

( ) Ho any Toamasina/ izaho sy ny zandriko //

(I and my younger brother are going to Toamasina)

This representation reflects in some way the accentuation pattern predicted by theoreticians. The main difference being the lack of accent in the final intonation-group (but a phonetic pitch peak is present) and the fact that the present representation does not resort to degrees of accents (primary / secondary).

Before moving on, it is worth summarizing the syntax-based approach (which was discussed in detail in chapter 5).

#### 6.4.4. Syntax-based approach.

According to Dahl (1952) and Rafitoson (1980) a sentence is partitioned into accentual groups (corresponding with immediate syntactic constituents); each syllable carrying lexical accent is marked as accented; then the last accented syllable of the last word of syntactic constituents is assigned primary accent, thus reducing the other accents to secondary ones. Thus, each accentual group is composed of secondary accents on each lexical accent in

the group and a primary or principal accent on the last lexical accent of the group. For example,

(7) Manàiky izány / áho. (Dahl 1952, p.198)

(agree that I)

(=I agree with that)

(8) Èfa lehibè tokoa / ny zánany. (Rafitson 1980, p,232)

( big true DET.chil-her)

(=her child is truly big)

Primary / principal accent is indicated with an acute accent mark in Dahl's notation and with a " in Rafitson's; secondary accent is indicated with a grave accent mark by Dahl and with ' by Rafitson.

After the accentuation pattern has been assigned to the sentence, the intonation pattern is aligned to it. Intonation in their analyses refers to the pitch pattern. Dahl (1952, p.198) simply mentioned that the primary accent has a higher intonation. Rafitson (1980) who follows the level analysts of intonation claimed that there are four significant levels in Malagasy (the bottom level being called level 1). Only level 1 and level 2 are relevant for declarative sentences and level 3 and 4 for interrogative ones. Since the focus is on declarative sentences, the



concern here is in her levels 1 and 2 which are illustrated in

" level 2  
" level 1

( ) Efa lehibe tokoa ny zanany  
| Predicate | Subject|

In Rafitoson's analysis the final 'tonic' syllable is at level 1 and the non-final one at level 2.

In the following paragraphs I will show that it is the intonation pattern which determines the accentuation pattern, i.e. that accent is accounted for by intonation.

The question is now: what determines intonation-groups? I propose to answer this question by mapping the intonation pattern (in terms of pitch prominence and intonation groups) with the syntactic structure.

## 6.5. Intonation and syntax

### 6.5.1. Short sentences.

First, consider the case of short sentences containing a subject, a predicate and an adverbial.

6.5.1.1. Subject position.

For instance,

(10) Nifarana tamin'ny efatra ny fivoriana  
(PAST.end PREP. DET four DET. meeting )  
Predicate | Adverbial | Subject |  
(=the meeting ended at four o'clock)

This sentence has 3 possible orders of the syntactic constituents, namely

\*

(10a) Nifarana tamin'ny efatra / ny fivoriana  
Predicate | Adverbial | Subject |

\*

(10b) Ny fivoriana / nifarana tamin'ny efatra.//  
Subject | Predicate | Adverbial |

\*

\*

(10c) Nifarana / ny fivoriana / tamin'ny efatra //  
Predicate | Subject | Adverbial |

As these examples show, intonation-groups do not correlate with syntactic constituents (i.e. Predicate, Adverbial, Subject) except when the order is Predicate-Subject-Adverbial. When the sentence adverbial (which I

write with a capital A to distinguish from the phrase adverbial) is placed between the Predicate and the Subject (Predicate-Adverbial-Subject), it constitutes one intonation-group with the predicate

#### Predicate Adverbial / Subject

and when it is placed after the Subject it constitutes an independent intonation-group

#### Predicate / Subject/ Adverbial

In each case the Subject always forms an independent intonation-group, which implies that, if a theory of Malagasy intonation is to make appeal to syntax, it is the position of the Subject in the sentence which determines the division into intonation-groups,

- a) Predicate Adverbial / Subject (2 intonation-groups)
- b) Subject/ Predicate Adverbial (2 intonation-groups)
- c) Predicate / Subject / Adverbial (3 intonation-groups)

This was hinted by Dahl (1952) who stated that the predicate and the subject do not belong to the same (accentual) group and developed by Rafitoson (1980) as already discussed in chapter 5 in this thesis. However, it will be shown later on that other (non syntactic) factors

also come into play in determining the intonation pattern.

This also seems to apply when a clause functions as a subject, as for example, in

\*

(11) Ny mpianatra tonga miofana eto England / dia faly sahirana  
ihany...

| S U B J E C T |

(DET students come study LOC. England)

(=the students who come to study here in England are..)

Here, the clause subject has the same structure as the short sentences analysed in 6.5.1. above. In a preliminary experiment, a few (9) Malagasy informants heard this particular sentence (among others) from a tape and they were asked to mark the accented syllables on the transcription. Six of them assigned accent to the second syllable of <England>. Other syllables in that sentence were also assigned accent but by fewer informants (the second syllable of <miofana> and of <mpianatra> (both of them are lexical accents and carry a slight rise in pitch phonetically) were assigned accent by 4 and 2 informants respectively). However, examples of clause subjects were rare in the data.

Given that the subject corresponds with one intonation-group, its (i.e. the subject's) position at the beginning or at the end of the sentence does not change the

intonation pattern of the short sentences above (2 intonation-group). But when it is placed between the Predicate and the Adverbial, it splits up the predicate and the Adverbial into two intonation-groups (i.e. there are 3 intonation-groups). This implies that the intonation pattern is to be based on the surface (not on the underlying) surface structure in Malagasy because the same syntactic constituents which form a sentence (such as example above) may be put in different orders -- without altering its meaning -- and this results in different intonation patterns.

This suggests that, from a prosodic point of view, Malagasy is subject orientated, in the sense that the division of a sentence into intonation-groups is dependent on the position of the syntactic function called Subject. From a syntactic point of view, and using a definition of 'subject' based on characteristic properties of subjects across different languages, Keenan (1976, p.249) claimed that Malagasy is to be classified among the Subject-prominent -- as opposed to Topic-prominent -- languages (Li and Thompson 1976) because it (Malagasy) "is highly subject prominent in the sense that very many of the syntactic processes of the language distinguish subject from non-subject NPs." With the structural-functional approach to syntax, Rajaona (1972, p.19) argued that a minimum sentence in Malagasy is composed of a predicate ('prédicat d'existence'), as in <tsena> (lit.market=there is market),

and therefore the syntactic analysis in Malagasy should be predicate orientated because "le predicat est l'element de base sans lequel il ne peut y avoir enonce..." (Rajaona 1972, p.699). Nonetheless, these two views do not contradict each other if the type of sentences mentioned by Rajaona are regarded as subjectless ones. This issue is left for syntacticians to investigate.

#### 6.5.1.2. Adverbials.

When the adverbial is placed after the Subject and if it (the adverbial) modifies the Subject, it belongs to the same intonation-group as the Subject. But if the adverbial modifies the sentence, it forms an independent intonation-group.

Predicate / Subject adverbial / (phrase adverbial)

Predicate / Subject / Adverbial (sentence Adverbial)

as in

\*

(12) Mivory / ny governemanta ankehitriny //

(PRES.meet DET.government present )

Predicate | Subject | adverbial |

(=the present government is meeting)

\*

\*

(13) Mivory / ny governemanta / ankehitriny //  
(PRES.meet DET.government present )  
Predicate | Subject | Adverbial |  
(=the government is meeting at present)

Nevertheless, this applies only when the adverbial is placed after the subject. When the adverbial modifies the subject, it is part of the same intonation group and cannot occupy a different position in the sentence, i.e. it obligatorily follows the subject.

When the sentence adverbial is placed between the Predicate and the Subject (Predicate-Adverbial-Subject), it constitutes an intonation-group with the predicate but this does not mean that it modifies the predicate alone because the same adverbial can be moved to post subject position where it forms an intonation-group separate from the subject as in (13), i.e. sentence adverbials are moveable. Thus, a sentence adverbial can occupy two different positions: either after the predicate -- in which case the predicate and the sentence adverbial form one intonation-group -- or after the subject -- in which case the sentence adverbial constitutes an independent intonation-group by itself; but an adverbial which modifies the subject can be placed only after the subject and always belongs to the same intonation-group as the subject.

The two facts above taken together (viz. that a subject

is always an independent intonation-group and any elements which modify it belong to the same intonation-group) may bring light onto some disagreements between syntacticians dealing with the Malagasy language. For example, in

- (14) Voasasako daholo ny lamba.  
(washed-I all DET. clothes)  
(=I have washed all the clothes)

The word <daholo> (all) -- which is believed to be borrowed from English 'the whole' -- modifies the predicate <voasasako> (washed-I, lit.washed by me) according to Dez (1980, p.171), but Rajaona (1972, p.598-602) is of the opinion that <daholo> is related to the subject <ny lamba> (the clothes) and therefore is an 'auxiliaire de sujet'. If the intonation pattern is considered

\*

- (14a) Voasasako daholo / ny lamba //

<daholo> does not belong to the same intonation-group as the subject and therefore the claim made by Dez above seems to be confirmed.

To sum up, as far as the relation between intonation and syntax in Malagasy short declarative sentences is concerned, the subject always corresponds with an intonation-group and its place in the sentence determines



the number of intonation-groups. When an adverbial is placed after the subject and modifies the latter, they form one intonation-group, otherwise they form two intonation-groups. However, it will be shown below that intonation is conditioned by factors other than syntactic ones.

### 6.5.1.3. Length.

Length (in terms of number of syllables) also influences intonation patterns. Take the case of two NPs connected by the coordinator <sy> (and) as a first illustration.

(15) Ny fahitany ny taloha sy ny ankehitriny/ dia..  
 (DET. see-their DET past and DET. present )  
                                   |      NP      |  |      NP                  |  
 (=their vision of the past and of the present... )

where two short NPs are connected by <sy> (and) and belong to one intonation group. Compare with

(16) Ny fahitan'ilay ankizy ny nitondrana ilay fatin'ny  
 (DET see      DET children DET. take-PAST DET. body DET  
                                   |                                  NP

olona tany amin'ny <sup>\*</sup> hopitaly / sy ny fahoriana nitranga  
 (people LOC. PREP.DET. hospital and DET. suffering happened  
 | | NP

tamin'ny fianakaviany tao amin'ny <sup>\*</sup> hopitaly / dia...  
 PREP. DET family LOC.PREP.DET.hospital.....)

(=the fact that the children saw the dead bodies being taken to hospital  
 and the family mourning at the hospital ...)

where the two long NPs connected by <sy> (and) are broken  
 up into two intonation groups.

Long utterances are very common in news bulletins as a  
 result of written texts and long NPs are read by breaking  
 them up into intonation-groups,

(17) (<sup>\*</sup>..fa azo antoka) ny hiakarany / amin'ny ankatoky ny famaranana/  
 amin'ny fiadina ny amboaran'i Afrika/ amin'ny ekipa tompon-daka//<sup>\*</sup>

(Lit.(..is certain) their reaching/ of the semi-finals / in the African  
 Cup games / for the champions //)

The breaking of utterances into short intonation-  
 groups is also observed in stylistic variations, as for  
 example, in a poet's speech during a radio interview,

(18) ...dia nahavitany/ tononkalo sahadry /tamin'izay fotoana izay / ary  
 nomeny anay//

(lit. ..cause them to make/ poems already / at that time/ and they gave  
 us//

Dahl (1952, p.198) also cited an example of the possibility to divide a long predicate (VP) into (his 'accentual' but my 'intonation-') groups in different ways. In the sentence

(19)Efa nanao akanjo tsara ho an'ny olona rehetra izay nangataka azy  
 | P R E D I C A T E |  
 ( made clothes good PREP. DET.people all who asked him

io mpanjaitra io.

DET tailor DET.)

| S U B J E C T |

(=This tailor has made good clothes for all the people who asked him to)

the long predicate which stretches from <Efa> to <azy> (him) can -- according to Dahl -- have the following possible intonation patterns

(19a)Efa nanao akanjo tsara ho an'ny olona rehetra / izay nangataka azy/



It appears, therefore, that in long utterances the division into intonation-groups cannot be predicted. Rhythm and tempo -- which have not been investigated here -- seem to play a role too.

With reference to example (19) cited above, Dahl (1952, p.198) pointed out that the words within each group are "unis par quelque lien logique".

It would appear that what links the words within each intonation-group in these examples is semantic cohesion. This means that the sequence of words which constitute an utterance are grouped into meaningful units. For instance, an unacceptable division of example (20) above would be

Ny anombohantsika ny / vaovao izao / maraina izao dia /...

because the determiner <ny> goes with <vaovao> and the discontinuous demonstrative <izao...izao> (this) goes with <maraina> (morning). The question of what constitutes meaningful or not meaningful units will not be dealt with in detail here because it will be beyond the scope of this study. Hence, the concept of meaningful units or sense units will be based on the native speaker's (the present investigator) intuition.

Let us look more closely at this semantic cohesion within intonation-groups.

6.6. Semantic cohesion within intonation-groups.

Semantic cohesion exists within intonation-groups in all the examples discussed above, whether the division into intonation-groups is influenced by the order or by the length of the syntactic constituents. That is to say, words within each intonation-group are semantically linked together.

The examples used so far have been complete sentences, consisting of (at least) Predicate + Subject in the traditional way or of VP + NP. However, to analyse intonation in relation to such sentences presupposes that utterances are always complete sentences. Yet, in conversations, declarative statements are often a word or a sequence of words which cannot be divided into Predicate and Subject or VP and NP. Consider the answers to the questions in the following extracts from conversations:

Q: Firy taona moa ianao izany no nipetraka taty?

(How long have you been here?)

\*

A: Vao telo volana / (Only three months)

Q: Dia aiza no toerana hianaranao? (Where will you study?)

\*

\*

A: Eny Ankatso / Antananarivo/

(At Ankatso, in Antananarivo)

Q: Tamana? (Have you settled down?)

A: Tsy dia tamana loatra / (not really)

Q: Misy firy mianadahy ianareo?

(How many children are there in your family?)

A: Fito / (seven)

Such statements are not spoken on a mono tone. They also have Fo contours similar to that found in the intonation-group in sentences, viz. with a pitch peak on the last lexical item. The range of that Fo peak in short utterances is often similar to the non-final Fo peak in the sentences above.

These show that division into intonation-groups is determined by semantic rather than syntactic factors. This suggests that the syntactic subject which corresponds with an intonation-group in the examples above should be defined at a semantic level of analysis but, again, a semantic analysis is not our concern here; it is a subject matter that future researchers may consider. Here are further evidence of the semantic factor.

#### 6.6.1. Ungrammatical sentences.

In monologues and interviews speakers often make false starts or change the topic or the structure of a

sentence, resulting in an 'ungrammatical' sentence (i.e. a sentence in which one or several elements do(es) not bear any syntactic relation with the other elements).

Without going into details, some cases are presented here where semantic cohesion exists within intonation-groups in 'ungrammatical' sentences . The following examples have been taken from different speakers,

\* \* \* \* \*  
( ) Miovaova/ ao anatin'indray andro/ ianao/'dia tsy ampoizina mihitsy  
fa mety hahita fizaran-taona efatra//  
(Lit.change/ within one day/ you/ unexpectedly/ may see four different  
seasons//)

The 'ungrammatical' element here is the verb <miovaova> (change) which does not have a subject. The speaker started off by saying that the weather changes and then suddenly changes the structure of the sentence by saying that you may see all four seasons in one day.

\* \* \* \* \*  
( ) Ny mpianatra aty/ aloha/ tena mijaly/ raha ny fahitanay azy/ ny  
fiainana /

azony sarotsarotra ihany/ na ny resa-bola aza//  
(Lit. students here/ / really suffer/ in our view/ the life/  
because rather difficult/ the question of money//)

The ungrammaticality of this sentence is due to the presence of the NP <ny fiainana> (lit. the life) which does not bear any relation with the other elements. The word



<aloha> does not have a specific meaning here. It is used in Malagasy in the same way as some English speakers would use parenthetical expressions like 'if you ask me' or 'I expect' which Radford (1981, p.61) calls 'intrusions'.

#### 6.6.2.Reading.

When Malagasy children learn to read (in Malagasy), they begin by reading syllable by syllable. It is only once they have grasped the meaning of the sentence being read that they can read fluently. Fluent reading (aloud) therefore means reading with the correct intonation pattern, i.e. grouping words together on a semantic basis, rising the tone at the end of each group and lowering the tone before a full stop.

This applies also in a foreign language learning situation, when learners -- children and adults alike -- start by decoding the foreign language word-by-word. Then words are grouped together on a semantic basis and the intonation-pattern of the mother tongue is transferred onto the target language. This may explain why, for instance, foreign learners of English group words into long intonation-groups; it could be that in their minds, such sequences have one meaning.

To summarize, intonation is determined by semantic factors. The division of an utterance into intonation-groups makes appeal to semantics, i.e. semantic cohesion is

obligatory within each intonation-group. Intonation-groups do not necessarily correspond with syntactic constituents (although they do in short sentences). For example, the analysis of longer sentences has shown that long Subjects (/NPs) or long predicates (/VPs) are broken up into intonation-groups.

Further evidence on the role played by semantics in the division into intonation-groups was given by types of utterances found in conversations (namely short utterances which are not complete sentences, false starts, ungrammatical sentences) and by situations such as reading and foreign language learning.

#### 6.7 Implications of an intonation-based theory of accent.

The implication of an intonation-based approach to accent is that accent and intonation are intertwined and therefore accent cannot be assigned independently of intonation.

##### 6.7.1. Accent is dependent on intonation.

Given a sequence like

(23) Hitako ilay olona voalazanao omaly.

(seen-I DET person told-you yesterday)





(20c) Ny anombohantsika ny       \*                               \*  
  vaovao/ izao maraina izao/ dia..

(20d) Ny anombohantsika ny                               \*  
  vaovao izao maraina izao/ dia...

On a semantic basis, what can be predicted is where the intonation-group boundary might occur but in actual fact, it depends on the speaker's realization of the utterance. Therefore, accent is not predictable.

This implies that accent will be dependent on all the factors which are known to influence intonation such as, for example, rhythm, tempo, speaker's style and so on.

Dependence of accent on intonation also implies that, at word level, lexical accent is related to intonation.

### 6.7.3. Lexical accent.

#### 6.7.3.1. Intonation pattern of citation.

I have defined the term 'accent' as referring to the abstract prominence of (a) syllable(s) in individual words or in sentences.

When words are said in isolation, they are spoken with an intonation of citation. In Malagasy, this is realized by a rise in pitch on the rightmost accented syllable and by a sharp drop in pitch on the post accented syllable(s), so that the rightmost accented syllable stands out more than the unaccented syllables. For example, in a

list of words 'accented' on the ultimate or penultimate syllable like <bádo> (illiterate) and <tetézana> (bridge) said with an intonation of citation (f.g. " ), the final (unaccented) syllable nuclei are not perceived by foreigners and are acoustically devoiced. It is that type of intonation which is also used in many phonetic analyses of Malagasy words (e.g. Rousselot 1913, Rakotofiringa 1967, and Verguin 1955). In accounts of English accent patterns, the English intonation of citation has frequently been referred to as the 'normal' intonation. This notion was attacked by Schmerling (1974) who claimed that 'normal stress' is in fact "stress used in citations" (Schmerling 1974, p.70).

The claim here is that lexical 'accent' is a result of the intonation pattern of words said in citation form which is the most common pattern in conversations, as, for example, in answers to questions, such as:

Q: Firy mianadahy ianareo? (How many children are there in your family?)

A: Fito. (seven)

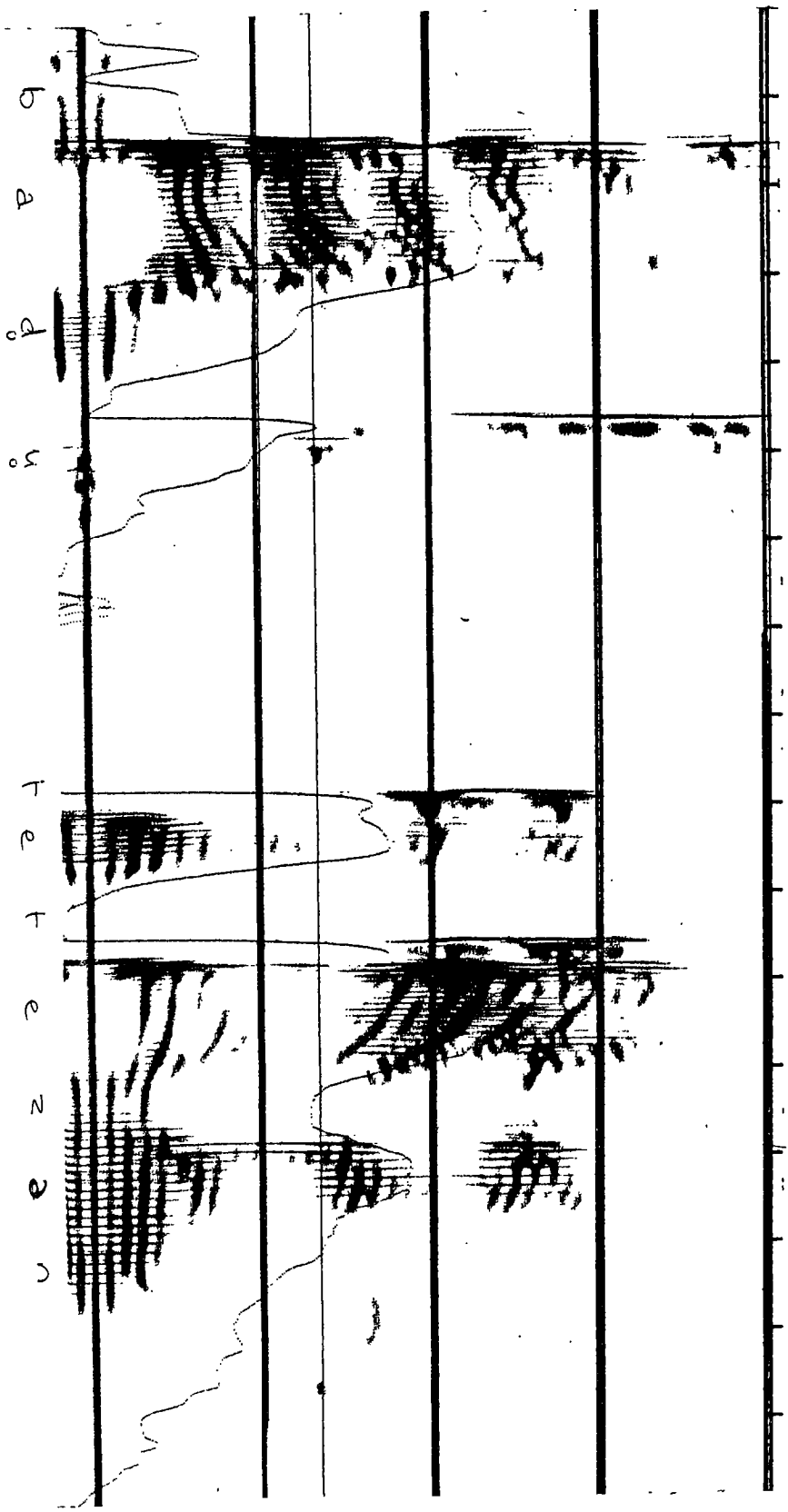
Q: Nahafinaritra ny dia? (Was the journey enjoyable?)

A: Mandreraka. (tiring)

Q: Betsaka gasy ve any? (Are there many Malagasy people there?)

A: Vitsy. (a few)

Fig. II. Last two of a list of Malagasy words said with an intonation  
< bado > of citation. < tetogana >



This implies that, in multisyllable words, there may be two 'accented' syllables (having abstract prominence) but only one, the rightmost, bearing the high tone. The linguistic relevance of the rightmost accented syllable, in Malagasy, is that it has the potential for high tone when the word is said in isolation or at the end of an intonation-group in citation (or declaration) forms and, therefore, can be regarded to as the 'tonic' syllable in that sense. As far as the analysis of Malagasy intonation (of declarative sentences) is concerned, the leftmost accented syllable is not relevant; but it may have some relevance in rhythm which has not been investigated here.

That the rightmost of two 'accented' syllables in isolated multisyllabic words (such as those found in experiment 1) is perceived more prominent than the leftmost one is also due to this intonation pattern.

It follows that the position and the nature of (word-) 'accent' as found in descriptions of languages is to be understood as the prominence pattern when words are said in isolation and with an intonation of citation (or declaration), unless otherwise stated. This is explicitly stated by certain authors, like Snouck Hurgronje (in Brandstetter 1916, p.340-341) in the description of word accent in one of the Indonesian languages, namely Achinese (/Achehnese) "When pronounced alone, in fact simply mentioned, all Achinese words are sounded so that both syllables have an equal stress, but the second syllable is



pronounced in the higher tone", but implicitly by a large number of authors.

#### 6.7.3.2. Intonation pattern of enumeration.

It would be interesting to investigate which syllable would be perceived as accented by linguistically naive listeners if, instead of being spoken with an intonation of citation, the words were spoken with an intonation pattern commonly found in enumeration. In enumerations, both the accented syllable and the ultimate unaccented syllable carry a high pitch (except in the last word of the list where the pitch drops in the post accented syllable). This pattern is illustrated in Fig 12. in the words [saina] <saina> (intellect) and [faalalana] <fahalalana> (knowledge) extracted from a monologue spoken by a female speaker. In a preliminary experiment that I had conducted, those two words said with an intonation of enumeration had a high pitch on both the accented syllable (penultimate in both cases) and the final unaccented syllable; both syllables in these two words were perceived by listeners as accented but the syllable which received more scores was the accented syllable in [saina] and the final unaccented syllable in [faalalana]. However, the number of listeners as well as that of words containing such a pattern in that experiment were too small and further investigation is needed before

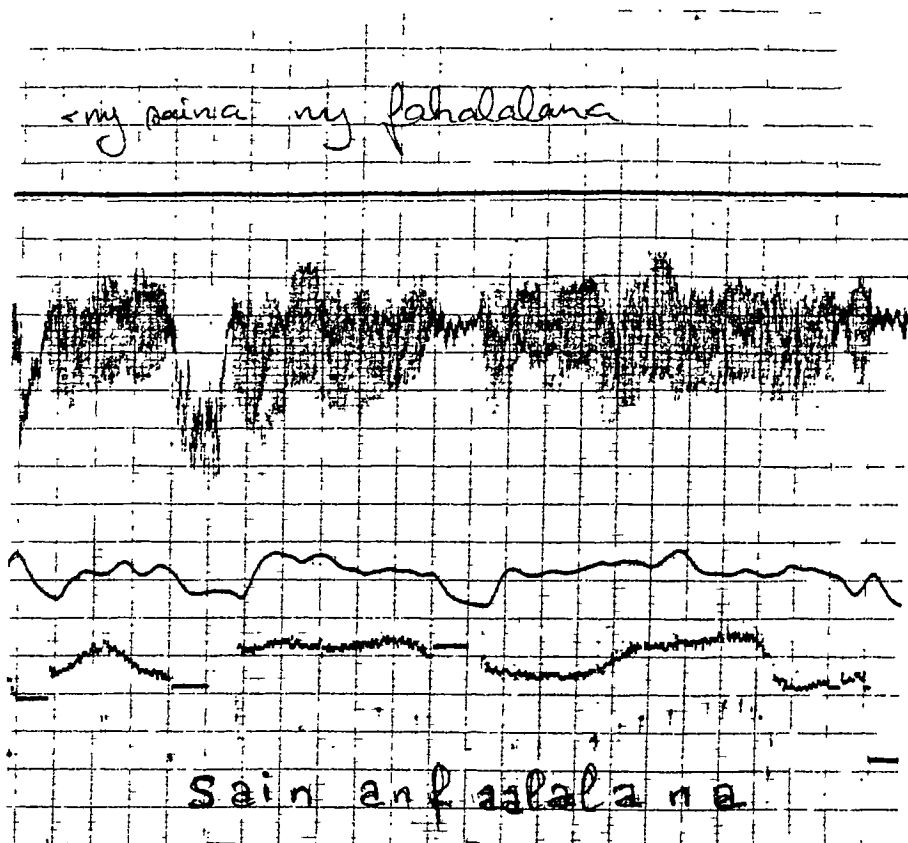
any conclusion can be drawn.

Zorc (1978) in Dahl (1981) reported some cases in the Philippines where 'accent' has developed from intonation, mainly in terms of kinship and in numerals. The original vowels in the initial syllables of Proto-Austronesian kinship terms such as [a:lak] (child) is believed by Zorc to be phonologically long but have become short and 'accented' as a result of a vocative intonation; "there is considerable evidence that the accent on these forms is the result of association with a vocative intonation, still active in many Philippine and Hesperonesian languages (Zorc 1978, p.94)" (in Dahl 1981, p.111). The same thing is observed in numerals as a result of a counting intonation (Zorc 1978, in Dahl 1981, p.111).

#### 6.7.3.3. Accent and tone.

The minimal utterance which corresponds with an intonation-group in this study is a word. Intonation-groups have two criteria: a high tone and semantic cohesion. It follows that intonation-group boundaries occur at the end of either a word in isolation which has a semantic content by itself or a group of words which are semantically linked together. That certain words -- like the determiner [ni] <ny> (the) or the negative particle [tsi] <tsy> (not), or the particle [nu] <no> -- are considered as 'unaccentable' is explained by the fact that they never occur by

Fig. I2. The words 'saina' and 'fahalalana' spoken by a female subject with an intonation of enumeration.



themselves, nor at the end of an intonation-group because they are necessarily followed by a noun, a verb, an adjective or a phrase to fulfil the semantic cohesion criteria. Other words which have identical phonetic structures, namely CV (consonant + vowel), but have an accent are words which either have a semantic content or can occur at the end of intonation-groups, e.g. [vi] <vy> (iron), [tsi] <tsihy> (mat) and [mu] <moa> as in <mifohaza moa!> (wake up!).

When the word is part of a longer unit (phrase or sentence) and within (not at the boundaries of) intonation-groups, the 'tonic' syllable loses its prominence, confirming Hyman's (1977, p.44) hypothesis that "a stress-accent comes into being when an intonational feature becomes associated with a grammatical unit smaller than a clause where a pause is frequently expected".

Finally, a few points which have proved to be of interest in the course of the present analysis are presented here for future investigators on Malagasy syntax and intonation.

#### 6.8. Points for further consideration.

It emerged from the mapping of intonation patterns to syntax above that prosody should be taken into account in the analysis of Malagasy sentence structures. The following points provide reasons to believe so.

### 6.8.1. Predicates.

The role played by intonation in differentiating between such syntactic structures in Malagasy was hinted by Rajaona (1972, p.33) in examples like

- (25) Misy trano.  
(exist house)  
(=there is a house)

\*

- (26) Misy ny masoandro.  
(exist DET sun )  
(=the sun exists)

in which the word <misy> denotes the existence of something. In (25) <misy trano> is a predicate whereas in (26) <misy> alone is the predicate. One of the evidences for the difference between these two examples is said -- by Rajaona -- to be in the prosody, namely a 'changement d'intonation'.

### 6.8.2. Phrases vs. sentences.

Next, consider the following examples

\*

(27) Ny ankizy / maditra // (sentence)  
(DEt children naughty) S --> NP + Adjective  
NP | Adjective  
(=the children are naughty)

(28) Ny ankizy maditra // (phrase)  
(DET children naughty) NP --> NP + Adjective  
NP | Adjective  
(= the naughty children)

As mentioned in chapter 5, (27) and (28) have identical structures. The presence of an accent (\*) in non-final position in (27) is indicative of the presence of two intonation-groups, as opposed to one in (28). This implies that in such cases, the intonation pattern distinguishes between phrases and sentences. A sentence is distinguished from a phrase by the presence of an accent (\*) in the first element. Here are further examples:

\*

(29 ) Razay / mpanjaitra// (sentence)  
(Razay dress-maker)  
NP | NP  
(Razay is a dress-maker)

(30) Razay mpanjaitra// (phrase)  
(Razay dress-maker)  
NP | NP  
(Razay the dress-maker)

Malagasy does not have an equivalent of the English (or French) copula 'to be' and the intonation pattern appears to compensate for that.

Note that, unlike English, Malagasy does not distinguish between

\* \*  
(31) mpampianatra malagasy / cp. an English teacher  
(teacher Malagasy)  
(=a teacher of Malagasy) (=a teacher of English)

and

\* \*  
(32) mpampianatra malagasy / cp. an English teacher  
(teacher Malagasy)  
(=a teacher who is Malagasy) (a teacher who is English)

If one wants to avoid ambiguity, the word <teny> (language) is sometimes used before <malagasy> to mean 'teacher of the Malagasy language'.

Intonation pattern also distinguishes between verb phrases and sentences which have identical structures,

\*

(33) Nitifitra / ny miaramila// (sentence)  
(PAST.shoot DET. soldiers)  
VP | NP S --> VP + NP  
(=the soldiers shot)

(34) Nitifitra ny miaramila// (phrase)  
(PAST.shoot DET. soldiers)  
VP | NP VP --> VP + NP  
(=shot the soldiers)

(34) is a verb phrase (or predicate) and requires a noun phrase (or subject) in order to form a complete sentence, e.g

\*

(34a) Nitifitra ny miaramila / ny mpanohitra //  
(PAST.shoot DET. soldiers DET. rebels )  
(=the rebels shot at the soldiers)

or, if the noun-phrase subject is fronted,

\*

(34b) Ny mpanohitra / no nitifitra ny miaramila//  
(DET rebels PAST-shoot DET soldiers )  
(=it is the rebels who shot at the soldiers)



6.8.3. Phrase adverbials vs. sentence Adverbials.

Given pairs of examples such as:

\*

\*

(35a) Hisy/ fivorian'ny mpampianatra/ ao amin'ny Oniversite//  
(FUT. meeting DET teachers LOC DET university)  
(=There will be a teachers' meeting at the university.

\*

(35b) Hisy/ fivorian'ny mpampianatra ao amin'ny Oniversite//  
(FUT. meeting DET teachers LOC DET university)  
(=There will a university teachers' meeting).

In 35a) the meaning is that any school or university teacher may attend the meeting and the venue is a university hall but in 35b) the sentence means that only university teachers are invited and the venue may be a place outside the university grounds.

\*

\*

(36a) Nampianatra/ i Hery namako/ tany Manakara //  
(PAST-teach DET Hery friend-my LOC Manakara).  
(=My friend Hery used to teach in Manakara)

\*

(37) Nampianatra/ i Hery namako tany Manakara //

(PAST.teach DET Hery friend-my LOC Manakara).

(=My friend Hery from Manakara used to teach)

Sentence (36a) means that my friend Hery used to teach in Manakara. Sentence (37b) means I have a friend called Hery whom I have known from Manakara who used to teach but not necessarily in Manakara.

Take one more example given by Dahl (1952, p.196), (the original version is in the interrogative form but I put it in a declarative form to simplify the comparison and substituted <ahy> (me) by <anao> (you); the accent pattern has not been altered, an acute accent mark indicates principal accent and a grave one a secondary accent)

(38) Niverina teto/ ralehilahy nitady anao teto /  
(PAST.return here DET.- man look for you here

tamin'ny herinandro lasa teo.  
PREP. DET.week last )

The interpretation given by Dahl (1952) is 'the man who looked for you here last week came back', i.e. the man looked for you last week and he came again (e.g. yesterday), but it can also mean 'the man who looked for you (e.g. two weeks ago) came again last week'. Dahl does not specify the reasons for putting the accentual group boundaries where they are in such sentences but they correspond to the intonation group boundaries. If <tamin'ny herinandro lasa

teo> (last week) refers to the time when the man came again, it is a sentence adverbial and the intonation pattern is,

\*

\*

(38 a) Niverina teto/ ralehilahy nitady anao teto/  
tamin'ny herinandro lasa teo//

but if it refers to the time when he first came, it modifies the clause <ralehilahy nitady anao teto> (the man who looked for you here) and the intonation pattern is

\*

(38 b) Niverina teto/ ralehilahy nitady anao teto  
tamin'ny herinandro lasa teo//

The intonation pattern removes the syntactic ambiguity between the two sentences in each pair. In each of sentences ( a ) the adverbial is a sentence adverbial and in each of sentence ( b ) it is a phrase adverbial linked to the subject NP.

#### 6.8.4. Coordination.

Consider two examples mentioned in chapter 5 (5.2.5.2.).

\*

(39) Manasa sy mipasoka / Raso //

\* \*  
(40) Manasa / sady mipasoka / Raso'a //

These two sentences have identical meanings (Raso'a washes and irons) but different coordinators are used, namely <sy> and <sady> both of which are equivalent to <and> in English or <et> in French.

The intonation pattern suggests that the substitution of <sady> to <sy> leads to a difference in intonation patterns. Yet, if both of them were conjunctions of coordination there is no reason why the intonation pattern should change since they occupy the same position in the sentence. On the other hand, <sady> -- but not <sy> -- can be placed in initial position in the sentence, in which case a particle <no> is required

\* \*  
(41) Sady manasa / no mipasoka / Raso'a //

but the intonation pattern in (40) is maintained. <Sady> and <sy> also differ in their usage. <sy> can conjoin two subjects (NPs), or two predicates (VPs), or two sentences whereas <sady> can conjoin only two predicates or two sentences but not two subjects. Of the following two sentences

(42) Milalao i Andry sy i Ndriana.

(play DET Andry and DET Ndriana)

(=Andry and Ndriana are playing)

(43) Milalao i Andry sady i Ndriana.

(43) is unacceptable in Malagasy. Why can two predicates be conjoined by <sady> and not two subjects? One possible answer could be that <sady> and <sy> belong to two different categories. If prosody plays a role in determining the structure of Malagasy sentences, then the difference in intonation patterns suggests that such is the case. Traditionally, Malagasy words have been classified into syntactic categories on the basis of their French or English translation and this may explain why both <sady> and <sy> have been considered as conjunctions of coordination.

It could well be that intonation plays a role in determining sentence structures in Malagasy but not in French or in English, in the same way that tone is a distinctive feature at word level in tonal languages but not in non tonal languages.

### **6.9. Conclusion.**

In this chapter I have described the intonation pattern in Malagasy neutral declarative sentences in terms of high tone and intonation-groups. Such description can account

for perceived accent in Malagasy without making appeal to degrees of accent and provide a better representation of accentuation patterns in Malagasy utterances.

The claim made here is that accent is determined by intonation and therefore it cannot be assigned independently of intonation. This implies that a knowledge of intonation pattern is prior to the analysis of accentuation pattern.

The accent pattern of isolated words is also attributed to the Malagasy intonation of citation.

Intonation is in turn determined by semantic factors. Semantic cohesion is a characteristic of each intonation-group and further research in semantic analysis will undoubtedly throw more light in the role played by semantics in prosodic analysis and vice-versa.

It is suggested that intonation may need to be taken into account for a description of Malagasy sentence structures. It seems, for instance, that intonation may compensate for the absence of an equivalent of copulas like 'to be' in English, French and other languages.

## SUMMARY AND CONCLUSIONS

The emphasis which has been laid throughout this thesis is that accent and tone are intertwined in the Merina dialect of Malagasy.

The very notion of 'accent' in Malagasy was introduced from the point of view of hearers (that is, foreign missionaries and grammarians) who described the Merina dialect in the nineteenth century. The definitions of Malagasy accent given by a few of them suggest that accent was associated with a high tone, a first indication that accent and intonation are linked in Malagasy.

Secondly, those hearers were non native speakers of Malagasy. Recent investigations in many languages have shown that pitch is the most readily perceived acoustic parameter. It can be assumed, therefore, that accent as perceived by the non native speakers of Malagasy was pitch accent, in the traditional English sense of the term. In addition, high pitch is always present in accent as judged by native Malagasy speakers as showed by the acoustic measurements of accent in chapter 4. These too, imply a close relation between accent and tone.

Descriptions of accent in other Austronesian languages -- also by non native speakers -- also provide support to the intonation-based theory of accent in the case of Malagasy, at least in the Merina dialect.

From the perspective of pitch-accent, phenomena attributed to accent are now regarded as related to intonation.

For example, what has been considered as an accent shift in borrowed words does not result from the constraint of accent rules but from that of intonation.

Lexical accent results from intonation of citations which is the most common in daily conversations and also in words and sentences which constitute the data in investigations on accent.

The judgment of accent by different groups of listeners have revealed some interesting facts concerning accent judgment. Most subjects who had no linguistic training are less consistent in their accent judgment than trained subjects are. Non native speakers' accent judgment also differs from that of native speakers. Non native here means non native speakers of a language and not of a dialect because the accent judgment of non native speakers of Merina as reported in experiment 3 did not differ from the native speakers' judgment. Acoustic parameters are not, therefore, the sole cues to accent. Most research on accent have -- up to date -- put too much emphasis on the role played by physical parameters in accent perception. It is perhaps time to look for non physical cues.

As for the relation between syntax and intonation, the correlation between syntactic constituents and intonation groups exists only in short sentences. Longer sentences and



utterances shorter than a sentence give evidence that intonation is not determined by syntactic factors. The strongest claim that can be made is that intonation is determined by semantic factors, as evidenced by the semantic cohesion which characterise each intonation-group. The change of intonation pattern which is determined by the word order in Malagasy sentences implies that intonation must be aligned to the surface syntactic structure. It is suggested that intonation should be taken into account in the analysis of Malagasy sentence structures.

Future research on intonation in the other Malagasy dialects, in the prosodic systems of Malagasy, in Austronesian languages and in semantics will hopefully throw more light on this matter for many questions are still unanswered.

APPENDIX 1

List of words in Experiment 1. Percentage scores of accent judgment and percentage informants who assigned accent to the syllables.

	group 1 (native)	group 2 (non-native)	group 3 (ling.trained)
1	bai bo ly	bai bo ly	bai bo ly
%sco.	63 85 1	69 87 0	60 86 0
%inf.	84 94 5	77 100 0	60 100 0
2	vi de o	vi de o	vi de o
%sco.	43 52 42	38 51 46	60 0 80
%inf.	52 63 52	53 61 53	60 0 80
3	za ri dai na	za ri dai na	za ri dai na
%sco.	56 3 89 3	64 0 94 2	73 0 100 0
%inf.	73 5 94 5	69 0 100 7	80 0 100 0
4	pi ti po a	pi ti po a	pi ti po a
%sco.	47 14 36 45	53 0 56 38	60 6 66 60
%inf.	57 15 52 52	69 0 69 54	80 20 80 60
5	pa si po ro	pa si po ro	pa si po ro
%sco.	59 5 78 0	66 0 100 0	80 0 86 0
%inf.	84 12 89 0	77 0 100 0	80 0 100 0
6	re po bli ka	re po bli ka	re po bli ka
%sco.	54 17 68 7	58 15 76 2	60 0 100 0
%inf.	73 36 84 15	69 23 84 7	80 0 100 0
7	so si a lis ta	so si a lis ta	so si a lis ta
%sco.	40 12 10 63 12	64 7 10 79 2	60 6 0 93 0
%inf.	57 26 21 84 21	77 15 23 84 7	60 20 0 100 0
8	ka po ra ly	ka po ra ly	ka po ra ly
%sco.	64 12 61 3	61 12 79 0	80 0 80 0
%inf.	84 21 78 5	77 38 100 0	80 0 80 0
9	go ver ne man ta	go ver ne man ta	go ver ne man ta
%sc.	35 42 29 50 5	53 15 2 79 5	53 26 0 86 0
%inf.	47 68 36 63 10	69 30 5 92 15	80 60 0 100 0
10	bo do fo tsy	bo do fo tsy	bo do fo tsy
%sco.	63 15 78 0	56 12 89 0	80 0 100 0
%inf.	73 21 100 0	69 23 100 0	80 20 80 0
11	ka ra va sy	ka ra va sy	ka ra va sy
%sco.	56 14 80 1	58 10 94 0	66 6 86 0
%inf.	73 31 94 5	77 23 13 0	80 20 80 0

12	pa li tao	pa li tao	pa li tao
%sco.	61 3 77	69 0 89	80 0 80
%inf.	68 10 89	92 0 100	80 0 80
13	ka pi te ny	ka pi te ny	ka pi te ny
%sco.	56 5 75 0	56 2 82 0	80 0 80 0
%inf.	73 15 94 0	61 5 84 0	80 0 80 0
14	po ri te ra	po ri te ra	po ri te ra
%sco.	40 3 91 1	51 2 76 5	80 0 86 0
%inf.	63 5 94 5	69 5 92 7	80 0 100 0
15	da bi lio	da bi lio	da bi lio
%sco.	71 8 73	69 2 74	80 0 80
%inf.	84 21 84	77 7 84	80 0 80
16	da mi za na	da mi za na	da mi za na
%sco.	63 1 87 7	69 0 89 2	80 0 93 0
%inf.	78 5 94 10	77 0 100 7	80 0 100 0
17	pre zi da	pre zi da	pre zi da
%sco.	66 7 89	56 0 82	80 0 80
%inf.	84 15 94	69 0 92	80 0 80
18	be ri te lo	be ri te lo	be ri te lo
%sco.	52 3 91 1	48 0 84 0	80 0 86 0
%inf.	73 10 100 5	69 0 92 0	80 0 80 0
19	pi o zi la	pi o zi la	pi o zi la
%sco.	54 17 54 10	48 10 64 0	46 6 66 20
%inf.	73 47 68 21	61 23 77 0	60 20 80 20
20	po li pi tra	po li pi tra	po li pi tra
%sco.	47 3 82 8	53 0 84 0	73 0 100 0
%inf.	57 5 94 15	69 0 92 0	80 0 100 0
21	kris ma sy	kris ma sy	kris ma sy
%sco.	63 66 3	58 84 0	80 80 0
%inf.	63 63 0	69 92 0	80 80 0
22	ka ri bo ne tra	ka ri bo ne tra	ka ri bo ne tra
%sco.	45 3 26 75 8	66 2 12 79 7	73 0 0 100 0
%inf.	73 10 47 89 15	77 7 30 92 7	80 0 0 100 0
23	do ko te ra	do ko te ra	do ko te ra
%sco.	45 5 85 3	43 0 89 7	80 0 80 0
%inf.	57 10 94 10	69 0 92 0	80 0 80 0
24	go ver ne ra	go ver ne ra	go ver ne ra
%sco.	47 36 68 7	61 7 84 0	73 0 86 0
%inf.	15 52 78 15	69 23 92 7	80 0 100 0

25	ka fi te ra	ka fi te ra	ka fi te ra
%sco.	56 0 87 7	56 0 87 5	80 0 93 0
%inf.	84 0 94 10	69 0 92 7	80 0 100 0
26	ko mi ni sta	ko mi ni sta	ko mi ni sta
%sco.	43 5 63 15	61 2 84 5	80 0 86 0
%inf.	52 15 78 15	92 7 92 7	80 0 100 0
27	be nja mi na	be nja mi na	be nja mi na
%sco.	66 19 68 5	48 17 69 2	73 0 86 0
%inf.	84 26 84 10	61 30 84 7	80 0 100 0
28	Je ro sa le ma	Je ro sa le ma	Je ro sa le ma
%sco.	68 1 17 73 1	64 2 20 74 2	73 6 13 86 0
%inf.	89 5 31 84 5	77 7 38 92 9	80 20 20 100 0
29	ka di ra	ka di ra	ka di ra
%sco.	52 35 15	69 33 7	80 20 20
%inf.	68 47 21	77 38 15	80 20 20
30	te le vi zi o na	te le vi zi o na	te le vi zi o na
%sc.	54 56 14 22 26 3	74 43 7 35 35 0	53 20 6 53 60 0
%inf.	73 68 31 47 36 5	77 46 7 38 53 0	60 20 20 60 60 0

APPENDIX 2

List of words in Experiment 1.  
Degree of agreement measured in Standard Deviation (SD)  
between informants on the accented syllables.

	group 1 (native)	group 2 (non-native)	group 3 (ling.trained)
1	bai bo ly 1.14 .90	bai bo ly 1.32 .50	bai bo ly 1.64 .89
2	vi de o 1.41 1.38 1.36	vi de o 1.28 1.39 1.44	vi de o 1.64 1.34
3	za ri dai na 1.2 .74	za ri dai na 1.44 .55	za ri dai na 1.3 0
4	pi ti po a 1.38 1.24 1.46	pi ti po a 1.32 1.31 1.46	pi ti po a 1.3 1.41 1.64
5	pa si po ro 1.08 .95	pa si po ro 1.29 0	pa si po ro 1.34 .89
6	re po bli ka 1.25 1.07	re po bli ka 1.36 1.10	re po bli ka 1.3 0
7	so si a lis ta 1.27 1.14	so si a lis ta 1.25 1.12	so si a lis ta 1.64 .44
8	ka po ra ly 1.17 1.16	ka po ra ly 1.34 .86	ka po ra ly 1.34 1.34
9	go ver ne man ta 1.26 1.14 1.34	go ver ne man ta 1.32 1.04	go ver ne man ta 1.14 .89
10	bo do fo tsy 1.28 .76	bo do fo tsy 1.31 .63	bo do fo tsy 1.34 0
11	ka ra va sy 1.33 .96	ka ra va sy 1.3 .37	ka ra va sy 1.22 .89
12	pa li tao 1.38 1.0	pa li tao 1.03 .63	pa li tao 1.34 1.34
13	ka pi te ny 1.24 1.04	ka pi te ny 1.43 1.12	ka pi te ny 1.34 1.34
14	po ri te ra 1.22 .73	po ri te ra 1.26 1.06	po ri te ra 1.34 .89
15	da bi lio 1.11 1.18	da bi lio 1.32 1.16	da bi lio 1.34 1.34

16	da mi za na 1.19 .83	da mi za na 1.25 .48	da mi za na 1.34 .44
17	pre zi da 1.2 .82	pre zi da 1.37 1.05	pre zi da 1.34 1.34
18	be ri te lo 1.26 .56	be ri te lo 1.19 .87	be ri te lo 1.34 .89
19	pi o zi la 1.11 1.38	pi o zi la 1.33 1.25	pi o zi la 1.34 1.41
20	po li pi tra 1.38 .84	po li pi tra 1.32 .96	po li pi tra 1.3 0
21	kris ma sy 1.24 1.24	kris ma sy 1.42 .96	kris ma sy 1.34 1.34
22	ka ri bo ne tra 1.16 1.04	ka ri bo ne tra 1.29 1.04	ka ri bo ne tra 1.3 0
23	do ko te ra 1.34 .83	do ko te ra 1.18 .85	do ko te ra 1.34 1.34
24	go ver ne ra 1.26 1.28 1.26	go ver ne ra 1.34 .87	go ver ne ra 1.3 .89
25	ka fi te ra 1.15 .83	ka fi te ra 1.37 .86	ka fi te ra 1.34 .44
26	ko mi ni sta 1.37 1.14	ko mi ni sta 1.11 .96	ko mi ni sta 1.34 .89
27	be nja mi na 1.15 1.17	be nja mi na 1.39 1.11	be nja mi na 1.3 .89
28	Je ro sa le ma 1.07 1.13	Je ro sa le ma 1.25 1.09	Je ro sa le ma 1.3 .89
29	ka di ra 1.26 1.26	ka di ra 1.32 1.35	ka di ra 1.34 1.34
30	te le vi zi o na 1.3 1.37	te le vi zi o na 1.3 1.4 1.4 1.2	te le vi zi o na 1.5 1.3 1.5 1.3

APPENDIX 3

List of words in Experiment 1.  
Number of times when syllables were judged as having stronger stress.

	group 1 (native)	group 2 (non-native)	group 3 (ling.trained)
1	bai bo ly 2 7	bai bo ly 3 4	bai bo ly 0 6
2	vi de o 5 3 3	vi de o 1 2 3	vi de o 0 6
3	za ri dai na 2 10	za ri dai na 0 7	za ri dai na 2 9
4	pi ti po a 1 3 7	pi ti po a 1 3 2	pi ti po a 0 0 4
5	pa si po ro 1 7	pa si po ro 3 5	pa si po ro 0 10
6	re po bli ka 2 11	re po bli ka 1 7	re po bli ka 1 10
7	so si a lis ta 3 6	so si a lis ta 2 7	so si a lis ta 1 9
8	ka po ra ly 0 5	ka po ra ly 2 8	ka po ra ly 0 9
9	go ver ne man ta 2 4 8	go ver ne man ta 4 5	go ver ne man ta 0 10
10	bo do fo tsy 2 8	bo do fo tsy 2 3	bo do fo tsy 1 10
11	ka ra va sy 3 11	ka ra va sy 1 7	ka ra va sy 0 13
12	pa li tao 5 6	pa li tao 0 8	pa li tao 1 9
13	ka pi te ny 2 9	ka pi te ny 3 4	ka pi te ny 0 9
14	po ri te ra 0 10	po ri te ra 0 4	po ri te ra 0 9
15	da bi lio 3 9	da bi lio 1 4	da bi lio 0 9

16	da mi za na	da mi za na	da mi za na
	0 10	2 5	1 9
17	pre zi da	pre zi da	pre zi da
	6 12	3 5	1 8
18	be ri te lo	be ri te lo	be ri te lo
	0 9	1 4	1 8
19	pi o zi la	pi o zi la	pi o zi la
	2 7	2 2	0 10
20	po li pi tra	po li pi tra	po li pi tra
	2 7	2 4	2 10
21	kris ma sy	kris ma sy	kris ma sy
	2 7	6 4	3 6
22	ka ri bo ne tra	ka ri bo ne tra	ka ri bo ne tra
	3 2 12	3 6	2 9
23	do ko te ra	do ko te ra	do ko te ra
	2 7	3 6	0 9
24	go ver ne ra	go ver ne ra	go ver ne ra
	3 4 8	4 5	0 10
25	ka fi te ra	ka fi te ra	ka fi te ra
	6 7	2 4	1 8
26	ko mi ni sta	ko mi ni sta	ko mi ni sta
	6 4	3 5	0 10
27	be nja mi na	be nja mi na	be nja mi na
	3 8	3 4	0 9
28	Je ro sa le ma	Je ro sa le ma	Je ro sa le ma
	3 5	4 6	2 8
29	ka di ra	ka di ra	ka di ra
	2 1	2 2	0 3 3
30	te le vi zi o na	te le vi zi o na	te le vi zi o na
	2 11 0 4	1 1 5 4	2 1 5



APPENDIX 4

Malagasy sentences for Experiment 2 and Exp. 3. Translations are given underneath the sentences. Phonemic transcriptions and predicted accent placements are found in Appendix 5.

1a) Manambady dokotera Ratefy.  
(married to doctor Ratefy = Ratefy is married to a doctor)

b) Manambady Dokotera Ratefy.  
(married Doctor Ratefy = Dr. Ratefy is married)

2a) Nalaiko ny sakafon'ny anabavin-draiko.  
(fetched-I the meal of the sister father-my= I fetched the meal of my father's sister).

b) Nalaiko nisakafo ny anabavin-draiko.  
(fetched-I (past)eat the sister father-my = I fetched my father's sister to have a meal with me.)

3a) Nalefa aloha ny renin'i Leva.  
(sent first the mother of Leva=Leva's mother was sent first)

b) Nalefa aloha ny renin'i Leva.  
(sent early the mother of Leva=Leva's mother was sent early)

4a) Ny renin'i Leva no nalefa aloha.  
(the mother of Leva who sent first=It was Leva's mother who was sent first).

b) Ny renin'i Leva no nalefa aloha.  
(the mother of Leva who sent early=It was Leva's mother who was sent early).

5a) Ilay mpampianatra malagasy avy niofana tany Ankatso.  
(the teacher Malagasy trained at Ankatso= the teacher who teaches Malagasy has been trained at Ankatso)

b) Ilay mpampianatra, malagasy avy niofana tany Ankatso.  
(the teacher Malagasy trained at Ankatso= the teacher who is Malagasy has been trained at Ankatso.)

6a) Sakafo tsotra izay mora andrahoina  
(meal simple which cheap cook = cook a meal which  
is simple and cheap)

b) Sakafo tsotra izay mora andrahoina  
(meal simple which easy to cook = a simple meal  
which is easy to cook).

APPENDIX 5

Phonemic and phonetic transcriptions of the target pairs of sentences in Experiments 2 and 3. Predicted accented syllables are underlined.

P1.a) /manambadi duktera ratefi/ [manambad duktera ratef]  
 b) /manambadi duktera ratefi/ [manambad duktera ratef]

P2.a) /nalaiku ni sakafu ni anabavindraiku/  
 [nalaiku n sakaf n na bavndraik]

b) /nalaiku nsakafu ni anabavindraiku/  
 [nalaiku nskaf n nabavndraik]

P3.a) /nalaefa aluha ni renin i leva/ [nalefalu n renn lev]  
 b) /nalaefa aluha ni renin i leva/ [nalefalu n renn lev]

P4.a) /ni renini leva nu nalefa aluha/ [nrenn leva nnalefalu]  
 b) /ni renini leva nu nalefa aluha/ [nrenn leva nnalefalu]

P5.a) /ilai pampianatra malagasi avi niufana tany ankatsu/  
 [le papjanatra malagas av nyfana tane kats]

b) /ilai pampianatra malagasy avi niufana tany ankatsu/  
 [le papjianatra malagas av nyfana tane kats]

P6.a) /sakafu tsutra izai mura andrahuina/  
 [sakaf tsutra ze mur andraun]

b) /sakafu tsutra izai mura andrahuina/  
 [sakaf tsutra ze mur andraun]

APPENDIX 6 A

First set of French sentences in Exp.2 & 3:

- Docteur Ratefy est marie. [1b]
- Je n'ai jamais vu un village aussi petit que celui-la.
- Le professeur,un malgache marie a une russe.
- J'ai cherche la soeur de mon pere pour dinner. [2b]
- Docteur Rabary est marie.
- Chaque eleve est alle cherche une tasse.
- On a d'abord envoye la mere de Leva. [3a]
- Nombreux sont ceux qui nient avec vehemence.
- Le professeur,un malgache qui vient de se former a  
Ankatso[5b
- J'ai invite mon amie africaine pour dinner.
- Fais cuire un repas simple qui n'est pas couteux [6a]
- C'est la mere de Leva qu'on a envoye d'abord. [4b]
- Ils disent que les esprits existaient autrefois.

APPENDIX 6 B

Second set of French sentences in Exp. 2 & 3:

- C'est l'aine de Lobo qu'on a envoye d'abord.
- Nombreuses sont les murailles fortes.
- Je n'ai jamais vu une main aussi petite que celle-la.
- Ratefy est marie a un docteur. [1a]
- Un repas simple qui est facile a faire cuire. [6b]
- J'ai cherche le repas de la soeur de mon pere. [2a]
- Le professeur de malgache qui vient de se former a Ankatso. [5a]
- On a envoye l'aine de Lobo de bonne heure.
- On a envoye la mere de Leva de bonne heure. [3b]
- Ils disent que les gens trichaient autrefois.
- Chaque eleve est alle cherche une copie d'etat civil.
- C'est la mere de Leva qu'on a envoye de bonne heure. [4a]

APPENDIX 7

Target pairs [P] of sentences and distractors in Exp.2 & 3.

1-Ilay mpampianatra malagasy avy niofana tany Ankatso.

Ilay mpampianatra malagasy avy niofana tany Ankatso.

2-Manambady dokotera Ratefy. [P1]

Manambady Dokotera Ratefy.

3-Ny renin'i Leva no nalefa aloha.

Ny renin'i Leva no nalefa aloha.

4-Sakafo tsotra izay mora andrahoina.

Sakafo tsotra izay mora andrahoina.

5-Nalaiko ny sakafon'ny anabavin-draiko. [P2]

Nalaiko nisakafo ny anabavin-draiko.

6-Ilay mpampianatra malagasy avy niofana tany Ankatso.

Ilay mpampianatra malagasy avy niofana tany Ankatso.

7-Ny zokin'i Lobo no nalefa aloha.

Ny zokin'i Lobo no nalefa aloha.

8-Nalefa aloha ny renin'i Leva [P3]

Nalefa aloha ny renin'i Leva.

9-Manambady Dokotera Ratefy.

Manambady Dokotera Ratefy.

10-Nasaiko hisakafo ny namako afrikana.

Nasaiko hisakafo ny namako afrikana.

11-Ny renin'i Leva no nalefa aloha. [P4]

Ny renin'i Leva no nalefa aloha.

12-Nalaiko nisakafo ny anabavin-draiko.

Nalaiko nisakafo ny anabavin-draiko.

13-Ilay mpampianatra malagasy avy niofana tany Ankatso.

[P5]

Ilay mpampianatra malagasy avy niofana tany Ankatso.

14-Sakafo tsotra izay mora andrahoina. [P6]

Sakafo tsotra izay mora andrahoina.

## APPENDIX 8

8 subsets used in Experiment 3. The figures in square brackets refer to the sentence numbers in the pairs.

Subsets i) to iv) (in different random orders):

- a) Sakafo tsotra izay mora andrahoina. [6a]
- b) Ilay mpampianatra malagasy avy niofana tany Ankatso. [5a]
- c) Ny renin'i Leva no nalefa aloha. [4a]
- d) Nalaiko nisakafo ny anabavin-draiko. [2b]
- e) Manambady dokotera Ratefy. [1a]
- f) Nalefa aloha ny renin'i Leva. [3b]

Subsets v) to viii) (in different random orders):

- a) Sakafo tsotra izay mora andrahoina. [6b]
- b) Ilay mpampianatra malagasy avy niofana tany Ankatso. [5b]
- c) Ny renin'i Leva no nalefa aloha. [4b]
- d) Nalaiko ny sakafon'ny anabavin-draiko. [2a]
- e) Manambady Dokotera Ratefy. [1b]
- f) Nalefa aloha ny renin'i Leva. [3a]



APPENDIX 9

Percentage scores for each syllable by each group in Exp.3. The sign + by speakers' reference indicates that the two tokens judged by the two groups were identical.

	1a. [manambad duktera ratef]								
Speaker									
Group 1	0	0	20	0	58	0	0	8	A +
Group 2	0	0	4	16	54	4	4	8	C
Group 3	4	0	12	8	66	0	0	37	D
Group 4	0	0	12	8	66	0	0	16	A +
Average %	<hr/>								
	1	0	13	8	61	1	1	17½	

	1b. [manambad duktera ratef]								
Group 1	0	4	58	0	4	0	0	0	A
Group 2	0	0	62	8	16	0	0	4	C
Group 3	0	0	83	0	16	0	0	33	D
Group 4	0	0	83	0	0	0	0	21	A
Average %	<hr/>								
	0	1	71½	2	9	0	0	14½	

	2a. [nalaiku n sakaf n nabavndraik]										
Group 1	0	41	0	0	0	16	0	0	0	B	
Group 2	0	41	16	4	12	12	4	0	0	4	D
Group 3	0	70	0	4	4	16	12	4	0	33	A
Group 4	0	50	0	0	0	29	0	0	0	16	B
Average %	<hr/>										
	0	50½	4	4	18¼	4	1	0	13¼		

	2b. [nalaiku nsakaf njanabavndraik]										
Group 1	2	0	0	0	0	37	0	12	0	4	B
Group 2	0	12	0	16	0	50	0	4	0	4	D
Group 3	8	16	0	4	8	58	21	0	0	33	A
Group 4	0	16	0	8	4	66	0	0	0	12	B
Average %	<hr/>										
	2	13	0	7	3	53	8	1	0	13	

(continues)

	3a. [nalef alu n renn lev]								
Group 1	0	4	0	79	0	0	0	4	C +
Group 2	4	50	12	21	4	0	0	0	A
Group 3	0	54	0	79	0	4	0	33	B
Group 4	0	54	0	70	0	12	0	12	C +
Average %	<hr/>								
	1	40½	3	61¼	1	4	0	12¼	

	3b. [nalef alu n renn lev]								
Group 1	0	12	0	70	0	4	0		C
Group 2	0	12	8	62	4	0	0		A
Group 3	4	21	12	50	4	4	37		B
Group 4	0	33	12	75	0	0	4		C
Average %	<hr/>								
	1	19	8	64	2	2	10		

	4a. [n renn leva n nalef alu]										
Group 1	0	4	0	41	0	4	0	20	0	33	A
Group 2	<hr/>										
Group 3	0	33	0	45	0	8	0	0	0	54	A
Group 4	0	25	0	25	0	4	0	29	4	58	B
Average %	<hr/>										
	0	20	0	37	0	5	0	16	1	48	

	4b. [n renn leva n nalef alu]										
Group 1	0	0	4	45	0	4	0	16	0	45	A
Group 2	0	0	0	29	0	0	4	37	4	0	D
Group 3	0	21	0	75	0	8	4	16	4	45	A
Group 4	0	25	0	25	0	0	0	58	0	54	B
Average %	<hr/>										
	0	11	1	43	0	3	2	32	2	36	

	5a. [le papjanatra mala-gasi av nyfana tanekats]																
Group 1	0	0	0	4	0	4	0	29	0	0	4	0	0	0	0	4	B +
Group 2	0	0	0	0	0	0	0	45	16	0	16	8	0	0	0	0	C
Group 3	8	0	8	0	0	0	4	66	4	0	0	0	0	8	0	33	D
Group 4	0	8	12	0	0	8	4	58	0	8	0	0	0	0	0	16	B
+																	
Average %	<hr/>																
	2	2	5	1	0	3	2	49½	5	2	5	2	0	2	0	13	

	5b. [le papjanatra mala-gasi av nyfana tanekats]																
Group 1	0	0	25	0	0	16	4	12	0	4	0	0	0	0	0	0	B +
Group 2	0	0	25	4	8	12	4	0	0	0	4	0	0	0	0	0	C
Group 3	4	21	25	0	0	8	0	37	8	0	0	0	0	4	4	16	D
Group 4	0	0	25	4	0	4	4	25	0	0	8	0	0	0	0	4	B +
Average %	<hr/>																
	1	5	25	2	2	10	3	18½	2	1	3	0	0	1	1	5	

	6a. [sakaf tsutra ze mur andraun]									
Group 1	0	4	25	0	4	70	0	4	4	C +
Group 2	0	12	16	0	0	66	0	0	16	A
Group 3	-----									
Group 4	0	12	16	0	0	75	0	0	33	C +
Average %	<hr/>									
	0	9	19	0	1	70	0	1	18	

	6b. [sakaf tsutra ze mur andraun]									
Group 1	0	0	75	0	4	4	0	0	0	C +
Group 2	0	12	62	0	4	21	0	4	8	A
Group 3	4	25	50	0	4	4	8	0	37	B
Group 4	0	4	37	0	0	16	0	4	29	C +
Average %	<hr/>									
	1	10	56	0	3	11	2	2	18	

APPENDIX 10

Experiment 3.

Figures indicate the highest percentage score for the underlined syllable. The percentage agreement between speakers on the same syllable is indicated in brackets.

<u>Groups</u>	<u>Sentences</u>	<u>Speakers</u>
	1a. [manamb <u>ad</u> dukteraratef]	
Group 1	<u>58</u> (66%)	A +
Group 2	54 (66%)	C
Group 3	66 (100%)	D
Group 4	66 (83%)	A +
Average	<hr/> 61 (78.75%)	
	1b. [manamb <u>ad</u> dukteraratef]	
Group 1	<u>58</u> (66%)	A
Group 2	62 (50%)	C
Group 3	83 (100%)	D
Group 4	83 (83%)	A
Average	<hr/> 71½ (74.75%)	
	2a. [nalaik <u>un</u> sakafnjanabavndraik]	
Group 1	<u>41</u> (83%)	B
Group 2	41 (50%)	D
Group 3	70 (100%)	A
Group 4	50 (50%)	B
Average	<hr/> 50½ (70.75%)	
	2b. [nalaik <u>un</u> sakafnjanabavndraik]	
Group 1	<u>37</u> (50%)	B
Group 2	50 (66%)	D
Group 3	58 (83%)	A
Group 4	66 (83%)	B
Average	<hr/> 53 (70.5%)	

	3a. [nalefalunrennlev]		
Group 1	79 (100%)		C +
Group 2	50 (50%)		A
Group 3	(83%)54	79 (100%)	B
Group 4	(66%)54	70 (83%)	C +
Average	<hr/>		
	3b. [nalefalunrennlev]		
Group 1	70 (83%)		C
Group 2	62 (100%)		A
Group 3	50 (100%)		B
Group 4	75 (100%)		C
Average	<hr/>		
	4a. [nrennlevannalefalu]		
Group 1	41 (50%)	33 (50%)	A
Group 2	-	-	
Group 3	45 (83%)	54 (83%)	A
Group 4		58 (83%)	B
Average	<hr/>		
	4b. [nrennlevannalefalu]		
Group 1	(66%) 45	45 (66%)	A
Group 2	(50%) 37		D
Group 3	(83%) 75	45 (50%)	A
Group 4	(66%) 58	54 (100%)	B
Average	<hr/>		
	5a. [lepjanatramalagasjavnyfanatanekats]		
Group 1	29 (33%)		B +
Group 2	45 (66%)		C
Group 3	66 (100%)		D
Group 4	58 (66%)		B+
Average	<hr/>		
	5b. [lepjanatramalagasjavnyfanatanekats]		
Group 1	25 (66%)		B +
Group 2	25 (33%)		C
Group 3	25 (33%)	37 (83%)	D
Group 4	25 (50%)	25 (50%)	B +
Average	<hr/>		

(continues)

6a. [sakaftsutrazemurandraun]		
Group 1	70 (100%)	C +
Group 2	66 (83%)	A
Group 3	-	
Group 4	75 (83%)	C +
Average	<hr/> 70 (83%)	

6b. [sakaftsutrazemurandrauna]		
Group 1	75 (100%)	C +
Group 2	62 (66%)	A
Group 3	50 (66%)	B
Group 4	37 (50%)	C +
Average	<hr/> 56 (70.5%)	

APPENDIX 11

Experiment 3.

Number of tokens (i.e. repetition of each sentence) in which 0, 1, 2, 3, 4 or 5 syllables were assigned prominence by each listener.

	<u>0 syll.</u>	<u>1 syll.</u>	<u>2 syll.</u>	<u>3 syll.</u>	<u>4 syll.</u>	<u>5 s</u>
L1	21	27				
L2		35	12	1		
L3	15	33				
L4	27	21				
L5	20	24	4			
L6		37	5	3	2	1
L7	2	40	6			
L8	6	42				
L9	1	44	3			
L10	34	10	4			
L11	8	23	15	2		
L12		46	2			
L13		4	23	21		
L14		27	21			
L15	9	18	20	1		
L16	14	33	1			
L17		44	4			
L18	1	8	38	1		
L19	4	39	4	1		
L20		10	21	13	4	
L21	11	26	11			
L22	1	47				
L23		16	27	5		
L24	30	18				
<b>Total</b>	<b>204</b>	<b>672</b>	<b>221</b>	<b>48</b>	<b>6</b>	<b>1</b>

APPENDIX 12

Intra-judge consistency. In the first column, L followed by a number refers to the listeners; the 2nd column refers to the number of syllables judged prominent (at least once) by each speaker over the 4 repetitions of the 12 sentences; the 3rd column indicate the number of syllables which were judged consistently (i.e. at least 3 times); the intra-judge consistency is given in column 4; Y in the last column refers to those who had linguistic training.

Listeners	prom.syll	consist/y	intra-agr.	Ling.tr.
Group 1.				
L1	10	7	70%	Y
L2	24	13	54%	
L3	14	6	42%	
L4	9	3	33%	
L5	15	7	46%	Y
L6	36	9	25%	
			Average $\overline{45\%}$	
Group 2.				
L7	16	12	75%	Y.
L8	13	10	76%	
L9	24	9	37%	
L10	13	1	7%	
L11	30	10	33%	Y
L12	15	12	80%	
			Average $\overline{51.3\%}$	
Group 3.				
L13	37	27	73%	Y
L14	26	14	53%	Y
L15	37	7	18%	
L16	17	7	41%	
L17	31	6	19%	
L18	26	21	80%	Y
			Average $\overline{47.3\%}$	
Group 4.				
L19	20	7	35%	
L20	35	24	68%	Y
L21	13	13	100%	
L22	24	10	41%	
L2	32	17	53%	Y
L24	8	2	25%	
			Average $\overline{53.6\%}$	



APPENDIX 13

Experiment 3. Intensity (in dB)

Speaker	1a. [ma na mbad duk <u>te</u> ra ra tef]								
Group 1	-16	0	0	-19	-4	-5.5	-8	-8	A +
Group 2	-2	-2.5	0	-5.5	-2	-6	-9	-4.5	C
Group 3	-2	-4.5	-2	-11	0	-8	-9.5	-8	D
Group 4	-16	0	0	-19	-4	-5.5	-8	-8	A +

---

	1b. [ma na <u>mbad</u> duk te ra ra tef]								
Group 1	0	-2½	-1	-15	-3½	-3½	-7½	-9	A
Group 2	-6	-5½	0	-19	-10½	-16½	-17	-11	C
Group 3	-3	-2	0	-12½	0	-6	-9½	-3	D
Group 4	-3	-3	0	-16	-9	-9	-13	-16	A

---

	2a. [na <u>lai</u> ku n sa kaf n na bav ndraik]										
Group 1	0	-3			-8½	-6½	-6½	-7½	-5½	-7½	B
Group 2	-3	0	-7½		-4	-4½	-11	-11½	-10½	-5½	D
Group 3	-1	0			-9	-9	-8	-10½	-6½	-10	A
Group 4	-0	-4	-4½		-5	-3½	-7	-8½	-3	-10	B

---

	2b. [na lai ku nsa <u>kaf</u> nja na bav ndraik]									
Group 1	-7.5	-3.5		-8	0	-8	-12	-9.5	-6	B
Group 2	-5.5	0	-5.5	-5.5	-2.5	-9.5	-9.5	-8	-5.5	D
Group 3	-2	0		-5.5	-3	-5.5	-7.5	-5.5	-6	A
Group 4	-5	-6.5		-9.5	0	-6.5	-7.5	-5	-4.5	B

---

	3a.	[na	lef	a	lu	n	renn	lev]	
Group 1		-9½	0	-1	-10½		-2	-6	C +
Group 2		0	-6	-2	-13		-3	-4	A
Group 3		0	-5	0	-10		-6	-5½	B
Group 4		-9½	0	-1	-10½		-2	-6	C +

---

	3b.	[na	lef	a	lu	n	renn	lev]	
Group 1		-22	-6	0	-12		-9.5	0	C
Group 2		0	-2.5	-4.5	-10.5		-2.5	-6	A
Group 3									B
Group 4		-12.5	-9	0	-11		-5	-5	C

---

	4a.	[n	renn	le	va	n	na	lef	a	lu]	
Group 1		0		-4	-6½	-11	-10	-8	-10	-15	A
Group 2		-3		0	-6		-6	-5	-8	-14½	
Group 3		0		-1.	-8½		-9	-12	-12	-19½	A
Group 4		0		0	-5		-8	-8	-5½	-9	B

---

	4b.	[n	renn	le	va	nna	lef	a	lu]		
Group 1		-1½		0	-11½	-7	-9	-10	-18		A
Group 2		0		-1½	-7	-7	-2½	-7	-5½		D
Group 3		-2		0	-10½	-5	-5	-9½	-16½		A
Group 4		0		-1	-5½	-9	-4	-6	-11		B

---

	5a.	[le	papjana	tra	ma	la-ga	sav	ny	fana	ta	ne	kats]				
Group 1		-6	-2	-4	-2½	-5	-7½	0	-5½	-9	-7	-4	-11	-6	B	
Group 2		-8	0	-3½	-3	-1½	-4	-3	-9	-10½	-4½	-7½	-9½	-10½	-4½	C
Group 3		-4	-8½	0	-6	-8	-8½	-9	-2	-10	-13	-10½	-10½	-12	-8	D
Group 4		-6	-2	-4	-2½	-5½	-7½	0	-5½	-9	-7	-4	-11	-6	B	

---

	5b.	[le	papjana	tra	ma	la	ga	siavny	fa	na	tanekats]						
Group 1		-7½	-7½	0	-7½	-11½	-5	-10	-4½	-8	-16½	-8	-14½	-4	-14½	-7	B
Group 2		-10	0	-6	-6	-3½	-11½	-6½	-6		-7	-15½	-14	-15½	-9½		
Group 3		-5½	0	-1½	-13	-5½	-3	-2	-7½	-8	-8½	-9	-5½	-8	-7½		D
Group 4		-7½	-7½	0	-7½	-11½	-5	-10	-4½	-8	-16½	-8	-14½	-4	-14½	-7	B

---

(continues)

	6a.	[sa	kaf	tsu	tra	ze	<u>mur</u>	a	ndra	uin]	
Group 1		-9	0	-10	-7	-9½	-11½	-6	-9½	-15	C+
Group 2		-5½	-4½	-6½	-6	-6½	-7	0	-5	-11½	A
Group 3	( 0	-3	-7	-3	-5	-9½		-9½	-5	-7½	B
Group 4		-9	0	-10	-7	-9½	-11½	-6	-9½	-15	C+

---

	6b.	[sa	kaf	<u>tsu</u>	tra	ze	mur	a	ndra	uin]	
Group 1		-7½	0	-8½	-4	-8½	-12½	-8½	-10½	-12½	C+
Group 2		0	-1½	-3	-1½	-1½	-1½	-3½	-3½	-1½	A
Group 3		-2	0	-2	-2½	-5	-7½	-2	-5½	-1½	B
Group 4		-7½	0	-8½	-4	-8½	-12½	-8½	-10½	-12½	C+

---

APPENDIX 14

Experiment 3. Duration (in ms)

	1a.	[ma na mbad duk te ra ra tef]		Speaker
Group 1		30 69 100 27 <u>92</u> 77 69 108		A +
Group 2		46 46 85 35 77 81 69 54		C
Group 3		46 46 88 15 104 69 65 65		D
Group 4		30 69 100 27 92 77 69 108		A +

---

	1b.	[ma na mbad duk te ra ra tef]		
Group 1		65 81 <u>142</u> 46 65 77 81 91		A
Group 2		46 54 92 42 92 62 81 62		C
Group 3		27 38 104 27 77 69 62 77		D
Group 4		69 77 154 38 85 73 62 108		A

---

	2a.	[na lai ku nsa kaf nja na bav ndraik]		
Group 1		58 <u>69</u> 35 58 81 58 81 104		B
Group 2		69 81 46 31 69 58 58 85 100		D
Group 3		73 100 27 38 85 81 65 92 112		A
Group 4		62 69 19 42 62 88 50 100 100		B

---

	2b.	[na lai ku nsa kaf nja na bavn draik]		
Group 1		69 69 69 <u>65</u> 69 50 88 96		B
Group 2		42 69 46 35 96 46 38 62 107		D
Group 3		58 62 15 50 103 85 62 100 123		A
Group 4		62 62 46 73 58 69 85 100		B

---

(continues)

	3a.	[na	le	fa	lu	nrenn	lev]	
Group 1	85	69	58	92	85	96		C +
Group 2	92	92	65	112	96	154		A
Group 3	62	81	65	77	108	123		B
Group 4	85	69	58	92	85	96		C +

---

	3b.	[na	le	fa	lu	nrenn	lev]	
Group 1	23	62	92	112	96	96		C
Group 2	96	69	77	100	92	138		A
Group 3	58	73	54	96	96	138		B
Group 4	27	69	77	115	92	96		C

---

	4a.	[nrenn	le	va	nu	na	le	fa	lu]	
Group 1	96	130	58	65	92	50	96	77		A
Group 2	-----									
Group 3	115	150	42	65	65	65	65	85		A
Group 4	108	85	50	46	62	50	77	100		B

---

	4b.	[nrenn	le	va	nu	na	le	fa	lu]	
Group 1	92	130	58	88	85	100	115			A
Group 2	92	115	85	77	81	31	115			D
Group 3	92	123	58	54	81	100	73	131		A
Group 4	100	108	62	58	77	73	73	69		B

---

	5a.	[lepa	pja	na	tra	ma	la	ga	sjav	ny	fa	na	ta	ne	kats]	
Group 1	50	65	58	46	65	65	92	77	35	15	46	65	69	77		B +
Group 2	31	54	58	54	69	58	77	76	50	31	42	46	50	62		C
Group 3	46	38	62	46	54	54	58	123	46	65	77	77	38	108		D
Group 4	50	65	58	46	65	65	92	77	35	15	46	65	69	77		B +

---

	5b.	[lepa	pja	na	tra	ma	la	ga	sjav	ny	fa	na	ta	ne	kats]	
Group 1	54	62	100	46	50	58	65	65	69	31	31	46	50	69	77	B +
Group 2	54	96	81	81	81	54	96	96	73	54	58	58	77			C
Group 3	35	38	70	62	15	38	46	77	54	46	34	38	46	58	65	D
Group 4	54	62	100	46	50	58	65	65	69	31	31	46	50	69	77	B +

---

(continues)

	6a.	[sa	kaf	tsu	tra	ze	<u>mur</u>	a	ndra	un]	
Group 1		23	54	27	46	85	<u>77</u>	88	92	123	C +
Group 2		31	69	50	62	77	127	96	100	162	A
Group 3		(81	104	81	50	77	35	69	88	162)	B
Group 4		23	54	27	46	85	77	88	92	123	C +

---

	6b.	[sa	kaf	<u>tsu</u>	tra	ze	mur	a	ndra	un]	
Group 1		38	77	<u>46</u>	69	69	38	69	96	112	C +
Group 2		38	73	62	62	77	88	115	112	185	A
Group 3		35	69	38	54	54	58	88	92	154	B
Group 4		38	77	46	69	69	38	69	96	112	C +

---

APPENDIX 15

Experiment 3.

Pitch (in Hz)

	1a.	[ma	na	mbad	duk	<u>te</u>	ra	ra	tef]	Speaker
Group 1		204	200	194	200	<u>236</u>	226	188	224	A +
Group 2		104	104	104	88	122	116	104	114	C
Group 3		116	116	112	116	128	120	104	116	D
Group 4		204	200	194	200	236	226	188	224	A +

---

	1b.	[ma	na	<u>mbad</u>	duk	te	ra	ra	tef]	Speaker
Group 1		192	186	<u>220</u>	202	206	188	176	228	A
Group 2		104	108	128	92	108	100	100	136	C
Group 3		112	114	132	125	116	110	96	130	D
Group 4		200	196	224	200	200	182	176	220	A

---

	2a.	[na	<u>lai</u>	ku	nsa	kaf	nja	na	bavndraik]	Speaker	
Group 1		190	<u>224</u>		200	200	176	170	186	192	B
Group 2		100	134	134	108	106	108	108	92	116	D
Group 3		188	210	194	184	200	184	172	174	190	A
Group 4		194	212	206	214	204	186	168	180	190	B

---

	2b.	[na	lai	ku	nsa	<u>kaf</u>	nja	na	bavndraik]	Speaker	
Group 1		208	200		212	<u>236</u>	186	172	186	186	B
Group 2		104	116	114	108	132	104	104	100	114	D
Group 3		208	194	200	206	224	208	174	170	200	A
Group 4		200	200		204	230	180	168	170	204	B

---

(continues)

	3a.	[na	<u>le</u>	fa	<u>lu</u>	nrenn	lev]	
Group 1	104	<u>136</u>	136	<u>140</u>	114	124		C +
Group 2	200	240	248	230	206	200		A
Group 3	192	216	248	232	190	204		B
Group 4	104	136	136	140	114	124		C +

---

	3b.	[na	le	fa	<u>lu</u>	nrenn	lev]	
Group 1	108	120	130	<u>136</u>	112	128		C
Group 2	188	192	214	228	200	222		A
Group 3	200	200	220	234	200	214		B
Group 4	100	124	136	144	128	144		C

---

	4a.	[nrenn	<u>le</u>	va	nu	na	le	fa	<u>lu]</u>	
Group 1	200	<u>224</u>	212	184	176	180	184	<u>196</u>		A
Group 2	-----									
Group 3	200	226	214	178	166	169	186	206		A
Group 4	208	224	204	174	162	170	188	200		B

---

	4b.	[nrenn	<u>le</u>	va	nu	na	le	fa	<u>lu]</u>	
Group 1	200	<u>226</u>	220		180	<u>200</u>	208	<u>200</u>		A
Group 2	112	164	132		106	120	129	116		D
Group 3	200	250	224	180	176	188	212	204		A
Group 4	200	252	212	176	172	200	208	180		B

---

	5a.	[pa	<u>pja</u>	na	tra	ma	la	<u>ga</u>	sav	ny	fa	na	ta	ne	kats
Group 1	208	212	200	212	180	180	<u>214</u>	208	180	190	184	208	170	224	
Group 2	100	124	116	116	110	100	126	136	100	116	96	92	92	128	
Group 3	120	130	116	112	112	104	124	116	100		110	110	118	130	
Group 4	208	212	200	212	180	180	214	208	180	190	184	208	170	224	

---

	5b.	[pa	<u>pja</u>	na	tra	ma	la	ga	sav	ny	fa	na	ta	ne	kats
Group 1	212	<u>224</u>	200	182	180	176	180	200	183	200	164	200	172	208	
Group 2	106	136	136	144	124	100	128	104		124	106	106	100	122	
Group 3	106	130	124	108	108	108	126	112	112	117	105	108	108	124	
Group 4	212	224	200	182	180	176	180	200	183	200	164	200	172	208	

---

(continues)



	6a.	[sa	kaf	<u>tsu</u>	tra	ze	<u>mur</u>	a	ndra	un]	
Group 1		140	124	134	124	100	<u>136</u>	136	108	132	C +
Group 2		225	220	236	208	194	246	244	188	216	A
Group 3	(	200	200	236	220	204	206	188	188	222)	B
Group 4		140	124	134	124	100	136	136	108	132	C +

---

	6b.	[sa	kaf	<u>tsu</u>	tra	ze	mur	a	ndra	un]	
Group 1		108	116	<u>142</u>	134	100	100	100	100	126	C +
Group 2		200	200	244	224	208	184	180	180	218	A
Group 3		220	220	234	214	200	180	184	194	204	B
Group 4		108	116	142	134	100	100	100	100	126	C +

---

APPENDIX 16a

Target words in short carrier sentences for Exp.4.  
English translations are given in Appendix 16b.

1-Nahavita <u>Krismasy</u> i Rija	[navita krismas ridz]
2-Nahavita <u>zaridaina</u> i Sala	[navita zaridain sal]
3-Nahavita <u>dabilio</u> i dada	[navita dabiliu dad]
4-lasa <u>kapiteny</u> i Zefa	[lasa kapiten zef]
5-lasa <u>governora</u> i Solo	[lasa guvernur sul]
6-lasa <u>republika</u> ireo	[lasa republik reu]
7-lasa <u>kominista</u> i Sina	[lasa kominist sin]
8-lasa <u>sosialista</u> izy	[lasa sosjalist iz]
9-lasa <u>prezida</u> i Tata	[lasa prezida tat]
10-lasa <u>kaporaly</u> i Rajo	[lasa kaporal radz]
11-naka <u>Baiboly</u> i Naivo	[naka baibul naiv]
12-naka <u>karavasy</u> i Faly	[naka karavasy fal]
13-naka <u>palitao</u> i Bary	[naka palitau bar]
14-naka <u>karibonetra</u> i Mena	[naka karbonetr men]
15-naka <u>dokotera</u> i Doda	[naka dukuter dud]
16-naka <u>pitipoa</u> i Voara	[naka pitipwa vvara]
17-naka <u>poritera</u> i Neny	[naka poriter nen]
18-naka <u>pasiporo</u> i Boto	[naka pasipor but]
19-naka <u>kafitera</u> i Leva	[naka kafiter lev]
20-naka <u>damizana</u> i Zafy	[naka damizan zaf]
21-naka <u>beritelo</u> i Dera	[naka beritel der]
22-naka <u>benjamina</u> i Fidy	[naka bendzamin fid]

APPENDIX 16b

English translation of the carrier sentences in App. 16a.

1-Nahavita            Krismasy   Rija

(past)celebrate Christmas Rija=Rija has celebrated Christmas

2-Nahavita zaridaina i Sala.

(past)do        garden            Sala = Sala has done (his) garden

3-Nahavita dabilio i dada.

(past)make bench            Dad = Dad has made a bench.

4-Lasa kapiteny i Zefa.

become captain            Zefa = Zefa has become a captain.

5-Lasa governora i Solo.

become governor            Solo= Solo has become a governor

6-Lasa repoblika ireo.

become republic    they = They have become republics

7-Lasa kominista i Sina.

become comunist            China= China has become communist.

8-Lasa sosialista izy.

become socialist    he = he has become (a) socialist.

9-Lasa prezida i Tata.

become president Tata= Tata has become (a) president.

10-Lasa kaporal i Rajo.

become caporal Rajo = Rajo has become (a) corporal.

11-Naka Baiboly i Naivo.

(past)fetch Bible Naivo= Naivo fetched a Bible.

12-Naka karavasy i Faly.

(past)fetch whip Faly= Faly fetched a whip.

13-Naka palitao i Bary.

(past)fetch jacket Bary=Bary fetched a jacket.

14-Naka karibonetra i Mena.

(past)fetch carbonate Mena=Mena fetched some carbonate.

15-Naka dokotera i Doda.

(past)fetch doctor Doda=Doda fetched a doctor.

16-Naka pitipoa i Voara.

(past)fetch peas Voara= Voara fetched some peas.

17-Naka poritera i Neny.

(past)fetch porter Mum = Mum fetched a porter.

18-Naka pasiporo i Boto.

(past)fetch passport Boto=Boto fetched (a) passport.

19-Naka kafitera i Leva.

(past)fetch coffee-pot Leva=Leva fetched (a) coffee-pot.

20-Naka damizana i Zafy.

(past)fetch jar Zafy=Zafy fetched (a) jar.

21-Naka beritelo i Dera.

(past)fetch braces Dera = Dera fetched braces.

22-Naka benjamina i Fidy.

(past)fetch flowers Fidy = Fidy fetched some flowers.

APPENDIX 17

Measured Fo (in Hz) of the syllables of the target words in Exp.4 (male speaker).

1	[naavita kris-mas ridz]
- 'acc.'	123 133
+ 'acc.'	128 149
2	[naavita za-ri-dain sal]
- 'acc.'	112 127
+ 'acc.'	113 151
3	[naavita da-bi-liu dad]
- 'acc.'	113 127
+ 'acc.'	127 141
4	[lasa ka-pi-ten zef]
- 'acc.'	125 141
+ 'acc.'	151 164
5	[lasa gu-ver-nur sul]
- 'acc.'	114 130
+ 'acc.'	122 151
6	[lasa re-pu-blik reu]
- 'acc.'	120 123
+ 'acc.'	146 140
7	[lasa ko-mi-nist sin]
- 'acc.'	131 124
+ 'acc.'	140 146
8	[lasa so-sj-a-list iz]
- 'acc.'	116 133
+ 'acc.'	141 150
9	[lasa pre-zi-da tat]
- 'acc.'	118 122
+ 'acc.'	132 143
10	[lasa ka-po-ral rad]
- 'acc.'	126 135
+ 'acc.'	144 151
11	[naka bai-bul naiv].
- 'acc.'	106 125
+ 'acc.'	126 146
12	[naka ka-ra-vas fal].
- 'acc.'	125 123
+ 'acc.'	144 143

13	[naka pa-li-to bar]
- 'acc.'	124 138
+ 'acc.'	146 160
14	[naka kar-bo-netr men]
- 'acc.'	123 124
+ 'acc.'	155 139
15	[naka du-ku-ter dud]
- 'acc.'	111 137
+ 'acc.'	115 165
16	[naka pi-ti-pwa vwar]
- 'acc.'	113 162
+ 'acc.'	154 162
17	[naka po-ri-ter nen]
- 'acc.'	119 133
+ 'acc.'	140 158
18	[naka pa-si-por but]
- 'acc.'	118 130
+ 'acc.'	143 156
19	[naka ka-fi-ter lev]
- 'acc.'	123 133
+ 'acc.'	141 158
20	[naka da-mi-zan zaf]
- 'acc.'	111 127
+ 'acc.'	128 147
21	[naka be-ndza-min lis]
- 'acc.'	114 130
+ 'acc.'	124 145
22	[naka be-ri-tel der]
- 'acc.'	112 143
+ 'acc.'	126 154

APPENDIX 18

English words spoken by a Welsh speaker in Exp.5. The words under consideration are the ones which are not in parentheses.

- 1a & b-(the) author (and) perfector (of our faith)
- 2-Consider (him)
- 3-(it is a ) difficult (life)
- 4-(give us two) pictures
- 5-struggle
- 6-(as a ) wrestling
- 7-(is) difficult
- 8-(have a) wrestling
- 9-(a) struggle
- 10-(is an) answer
- 11-consider (him)
- 12-motive
- 13-considering (Jesus Christ)
- 14-(a) description
- 15-(the) original (says)
- 16-(think) especially
- 17-christianity (is)
- 18-(is also an) example
- 19-(this) motive (and not)
- 20-(let's look at some) examples
- 21-physical
- 22-(your) physical (condition)
- 23-(had an) illness
- 24-(blame our) spiritual (life)



APPENDIX 19

Experiment 5. Malagasy listeners' judgment of prominence in Welsh-English words. Stressed syllable nuclei are underlined. Scores of prominence judgment are written above the syllables and the physical maxima present within the syllable is represented by A (maximum Fo height), B (maximum Fo movement), C (maximum intensity) and D (maximum duration).

- |  |   |
|--|---|
| <p>4 3</p> <p>1a. <u>author</u> [ɔ:θə]<br/>A BCD</p><br><p>3 4 1</p> <p>2. <u>consider</u> [kənsidə]<br/>CD B A</p><br><p>3 4</p> <p>3. <u>difficult</u> [difikəlt]<br/>C A BD</p><br><p>4 4</p> <p>4. <u>pictures</u> [piktʃəz]<br/>C B</p><br><p>2 4</p> <p>5. <u>struggle</u> [strʌgl]<br/>C B</p><br><p>4 3</p> <p>6. <u>wrestling</u> [reslɪŋ]<br/>C B</p><br><p>2 5</p> <p>7. <u>difficult</u> [difikəlt]<br/>A B</p><br><p>3 3</p> <p>8. <u>wrestling</u> [reslɪŋ]<br/>C B</p><br><p>1 4</p> <p>9. <u>struggle</u> [strʌgl]<br/>B</p> | <p>1 4 3</p> <p>1b. <u>perfector</u> [pəfektə]<br/>B AC</p> |
|--|---|

(continues)

5 2  
10. answer [ansə]  
AD BC

4 4 1  
11. consider [kɒnsidə]  
C B AD

5 4  
12. motive [motiv]  
C B

2 5 1  
13. considering [kənsidəriŋ]  
D B

2 2 5  
14. description [dɪskrɪpʃən]  
BCD

1 3 4  
15. original [ɔri inəl]  
B AD

3 5 1 1  
16. especially [əspɛʃjəli]  
BD

2 2 3  
17. christi-a-nity [kristjaniti]  
BCD

6 1  
18. example [ɪgzɑmpl]  
BCD

4 3  
19. motive [motiv]  
AD B

2 2 5  
20. examples [ɪgzɑmplz]  
A BC D

(continues)

4 5  
21. physical [fizikəl]  
C A D

3 6 1  
22. phy-sical [fizikəl]  
AC

6 1  
23. illness [ɪlnes]  
B A

1 1 4 1  
24. spiritu-al [spɪrɪtʃuwəl]  
C A BD

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