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The Acquisition of Parameters for Word Stress By French Learners of English

Joseph V. Pater

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Abstract

The Acquisition of Parameters for Word Stress By French Learners of English

Joseph V. Pater

This study is an examination of the generalizations a group of French learners are making about English word level stress. The theoretical framework assumed for examining these generalizations is that of a parameter based model of metrical phonology. This model is presented in its historical context, and is justified in relation to current approaches. An analysis of the stress patterns of English, demonstrating how a quite complex system can be generated by a small number of parameters, is then outlined.

In a survey of the small body of theoretical and experimental literature that does exist on the learning of stress, the hypothesis that learners can store the stress patterns of words lexically, without immediately setting the parameters, is seen to be given considerable plausibility. Because of the possibility of learners acquiring the stress patterns word by word, it would seem that a methodological imperative in a study of metrical parameter setting is to control for word familiarity.

In the study presented here, nonce words were used to ensure that stress placement was being performed on the basis of generalizations about the stress system, rather than on the basis of knowledge of individual words. The results support

the view that these French learners have reset metrical parameters, although the settings adopted are sometimes different from those of English.

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Contents

1. Introduction

The acquisition of the lexical stress patterns of languages has received little theoretical or empirical attention in the first or second language literature. This is unfortunate for a number of reasons. Lexical stress, and in particular English stress, is a unique case. There exists a fair bit of agreement in the theoretical literature about how the patterns of English stress are to be explained. The explanation typically involves an analysis in terms of set of simple rules (or parameters) that interact to produce the wide variety of stress patterns found among English words. Such rich interaction of parameters is unique to the study of stress. Because of this interaction, it is necessary to study the whole set of about eight in an investigation of their acquisition. Studies of syntactic parameters, on the other hand, tend to focus on the acquisition of one, or perhaps two of them.

For second language acquisition research, the study of English lexical stress is particularly interesting because it is generally considered too complex to teach, except for a few handy, easily memorized guidelines. These are almost always rules for the placement of stress in affixed words[1]. However, the parameters discussed above, and to be investigated below, generate the stress patterns of monomorphemic words. Most native speakers, with the exception of those who have some background in linguistics, are unaware of the existence of these patterns. In Quebec, where the subjects in the present

study all learned English, the classes in ESL in public schools follow a communicative syllabus, and are thus especially unlikely to focus on stress patterns as part of the lesson. Thus, any internalized knowledge of English stress can most likely be attributed to the learners, at some, probably less than conscious level.

The study to be presented here could be approached from a variety of angles. One might read it as a phonologist interested in, but not specializing in the theoretical and empirical issues surrounding language acquisition. Conversely, the reader might be an acquisitionist, interested in, but not specializing in phonology. And of course, the reader could have a background in second language research, with or without any special knowledge of current linguistic theories of language acquisition or of phonology. One might even read it as a teacher of ESL. The last reader should be forewarned, though, that all references to teaching methodology in this thesis have been made in the preceding paragraph. Any conclusions to be drawn about the teaching of English on the basis of the following study are strictly the responsibility of the reader, for it is the opinion of the author that such prescriptions for language instruction can not be justified in the present case.

Each of the disciplines of phonology, theory of language acquisition, and second language research, has its own theoretical frameworks, methodologies and jargon that may or

may not be familiar to a specialist from one of the other fields, and the perspective of each of the following three chapters is roughly that of those three disciplines. In writing them, I have tried to make the terminology used as transparent as possible to someone who is unfamiliar with the specific field of inquiry, while at the same time attempting to maintain a theoretical rigour that may satisfy the specialist. To the extent that I am unsuccessful, I apologize in advance for any confusion or boredom that I might cause.

The first chapter provides a overview of the last twenty-five years of the phonological study of stress. The chapter concludes with a discussion of the theory of stress adopted in the present study, which is that of metrical parameters. The second chapter examines the theoretical work that has been done on the setting of metrical parameters, and, to a certain extent, parameters in general. The second half of the chapter critically discusses the empirical literature in the light of the acquisition theory, concluding with an overview of the previous second language literature. The final chapter presents a pilot study of metrical parameter setting in the case of French learners of English.

Note to chapter 1

1. One exception being Dickerson (1989), as pointed out by Prof. N. Belmore.

2. Theoretical issues in English stress
2.1 Historical overview

The phenomenon of word stress in English has recently been given considerable theoretical attention. Though at first glance one might assume that the placement of stress in monomorphemic English words is entirely arbitrary, or 'free', there does appear to be a system governing it. In structuralist accounts of English, stress is considered an underlying property of individual phonemes, and English is in fact treated as a "paradigm case of a language with 'free stress'" (Goyvaerts & Pullum 1975: 201). The first elaborated challenge to this view is presented by Chomsky and Halle in their (1968) The Sound Pattern of English (hereafter SPE). Working under the assumption that the stress patterns of words are derived by rule, rather than being simply marked in the lexicon, they uncovered some significant generalizations which still guide current approaches to the problem of defining the set of rules for English stress. Here I will discuss only the case of unaffixed nouns, both for ease of exposition, and because they have been the focus of my research.

The SPE discussion of stress placement in nouns is initiated with the introduction of three classes of nouns. They are given as in (1) (Chomsky & Halle 1968: 71):

(1)

I	II	III
America	aroma	veránda
cinema	balalaika	agénda
aspáragus	hiátus	consénsus
metropolis	horizon	synópsis
javelin	thrombósis	amálgam

vénison	coróna	uténsil
ásterisk	aréna	asbéstos
ársenal	Minnesóta	phlogíston
lábyrinth	angina	appéndix
análysis	factótum	placénta

In their explanation of these patterns of main stress Chomsky and Halle were hindered by their approach to the formulation of rules, which took into account only individual segments, and not their syllabification. Because of this, the set of ordered rules they were forced to posit was for the most part viewed as "excruciatingly complex" (Sampson 1975: 464). The basic generalization, however, was that for nouns with a final lax vowel (all of the above words), the penultimate vowel is stressed if it is tense (column 2 above), or if it is lax and followed by more than one consonant (column 3). If neither of these conditions is met (i.e. the penultimate vowel is lax and followed by only one consonant), then the antepenult is stressed (column 1).

In a number of articles responding to the proposals in SPE (e.g. the reviews by McCawley 1975 and Hill & Nessly 1975), it is argued that a more parsimonious account of these regularities can be arrived at by considering the syllable structure of the words. Such an approach has been adopted in the recent work within the framework of metrical phonology, which has been almost entirely devoted to the elaboration of the process of stress assignment in various languages (Durand 1990 and Goldsmith 1990 present useful overviews of this field). Metrical phonology, along with autosegmental phonology

(Goldsmith 1976, 1990) and dependency phonology (Anderson & Ewen 1987, Durand 1990), is characterized as being a brand of non-linear phonology by virtue of the fact that it recognizes various levels of representation and organization, in contrast with traditional generative (i.e. SPE-like) phonology which confined itself to a representation of a linear set of segments. The syllable seems now to be universally recognized as a level of organization in phonology, though how best to represent its structure has been the subject of ongoing debate. Before proceeding to a metrical account of English stress, a brief discussion of the syllable is necessary, since the syllables form the base of the hierarchical structure created in stress assignment.

2.2 The representation of the syllable

The debate over the structure of the syllable is most concerned with whether an intervening level of organization between the syllable and the segment is required, and if so, how much of this intervening structure is needed. The earliest non-linear incorporation of the syllable into generative phonology (Kahn 1976) uses a quite spartan representation, showing only the groupings of the segments into syllables by means of lines between a symbol representing the syllable (σ) and the segments, as in (2).

(2)

Most theorists now feel that a more elaborate branching structure is needed, one that is capable of representing groupings of segments within the syllable. At a minimum, it seems that a distinction is needed between the onset and the rime. The onset is that part of the syllable that precedes the peak or nucleus of the syllable, the latter being made up of one or more vowels or a syllabic consonant. The rime is the segmental material including the nucleus and all that follows it. The material following the nucleus is termed the coda. In the word bait, for example, the onset is /b/, while the rime is the sequence /ait/, /ai/ being the nucleus, and /t/ the coda. One of the strongest arguments for the onset/rime distinction comes from the consideration of the facts of stress assignment. Since Hayes (1981), it has usually been maintained that the onset plays no role in the determining of stress placement, while the composition of the rime is a factor in the stress assignment processes of a number of languages, including English (though see Davis (1988) for an argument for onsets as factors in stress rules).

Turning back to the examples given by Chomsky & Halle, we note that those in the second and third column (aroma and agenda) are distinguished from those in the first column

(America) on the basis of their being stressed on the penultimate syllable, while those in the first are stressed on the antepenult. In the SPE framework, there is no explanation for why these two classes of words are stressed similarly. This is reflected in the postulating of separate stress rules for each group. The first step toward describing these words as a single class was the recognition that not only are the vowels in the stressed syllables of the aroma-type words tense, but they are also long (Liberman & Prince 1977). Given that long vowels in English can be represented as a sequence of a vowel and a glide, the generalization can be made that those in the first column contain only one element in the penultimate rime, while those in II and III contain two.

There is some controversy over how to formally represent and describe the difference between these rimes. One position, taken by Hayes (1981, 1982) and Halle & Vergnaud (1987) (hereafter H&V), is that the distinction is between branching and non-branching rimes. As shown in (3), the penultimate rimes in agenda and aroma branch, while the one in Canada does not.

(3)

Hayes, but not H&V, refers to this branching distinction as one of quantity. That is, a syllable in which the rime branches is termed heavy, in contrast with a light syllable with a non-branching rime. Languages that use such a quantity distinction for the determination of stress placement are referred to as quantity sensitive.

Another position, taken by Prince (1983), Hyman (1985), and Hayes (1987), is that the difference between the syllables should be described only as one of weight, formalized by the use of units called moras, variously represented as m or μ. In this formalism, light syllables are monomoraic, and heavy ones bimoraic. The reader is referred to the above mentioned authors for arguments in favour of the moraic theory, as they hinge on analyses of stress assignment and other prosodic processes in languages other than English, and to elaborate them would take us far from present concerns.

Within an analysis of English, a choice between the two modes of representation is relatively inconsequential. In what follows, the neutral and less opaque terms heavy and light will generally be used instead of non-branching/branching, or monomoraic/bimoraic. To sum up then, in English a syllable is counted as heavy (bimoraic) if it contains a long vowel or a closing consonant in its rime, which is thus branching. A light (monomoraic) syllable is one that contains only a short vowel in its rime, which is non-branching. How this distinction plays itself out in the stress system of English

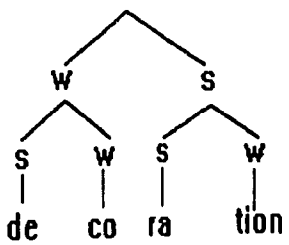
is the question to which we now turn.

2.3 The metrical analysis of English stress

2.3.1 The representation of stress

As in syllable theory, there has been considerable debate over how best to represent the relative levels of prominence between syllables, as well as whether an intervening level of structure between the syllable and the word is needed. This discussion has taken place within the domain of metrical theory, inaugurated by Liberman and Prince (1977) (L&P). In SPE, stress is represented as a numerical value assigned to individual segments. In contrast, L&P argue cogently that stress is strictly relative, and that it only makes sense to say that a syllable is more or less prominent than another, not that a given syllable has an inherent amount of stress. They capture this in a formalism in which syllables are grouped into feet, by means of branching lines similar to those used to designate syllable structure above, and are marked as either strong (s) or weak (w). The feet are in turn grouped into a word, and also marked as strong or weak. This is shown in (4).

(4)



This sort of representation is referred to as the metrical tree. L&P also make use of the metrical grid. The grid in L&P is derived from the tree, and does not show the groupings, or constituenc structure of the syllables (i.e. foot structure) but only their prominence. A grid is obtained from a tree by assigning an asterisk to each syllable, and then an extra one for each of the s marks above it in the tree. The grid for decoration would be as in (5).

(5)

```
      *
    *   *
    * * * *
  decoration
```

A debate has since ensued in the literature over whether trees or grids, or both, are to be used to represent metrical structure. Selkirk (1980), Giegerich (1986) and Hayes (1981, 1982) use only trees, Selkirk (1984) and Prince (1983) only grids, with Hayes (1984) and L&P using both. As we have seen, the strength of the tree is that it provides a representation of constituency, while the grid offers a more straightforward illustration of prominence. The grid also allows an extremely parsimonious statement of rhythm adjustment rules, such as the Rhythm Rule in English, in which thirteen men becomes thirteen mén, as simply 'Move *' (Prince 1983). This is shown in (6).

(6)

```
      *   *       *     *
    * * * *       * * * *
    * * * *       * * * *
  thirteen men ---> thirteen men
```

This type of rule is generally held to be more difficult to

formalize using trees, though Giegerich (1986) argues that only the tree formalism provides a descriptively adequate account of the phenomenon.

An interesting compromise is reached in H&V and Hayes (1987). In these works, a grid is used, which displays constituency by means of brackets surrounding the asterisks, as illustrated below.

(7)

```
        *
(*      *)
(* *)(* *)
deco ration
```

H&V argue that constituency is an essential characteristic of all linguistic representation, and must therefore be encoded in a metrical representation. Since this formalism retains the advantages of the grid, and also displays constituency relations, it will be adopted in the present work. This is not, however, to signal an adoption of the rules used for the construction of the grid by H&V. In the next section, it will be argued that their analysis of English stress posits an unduly complex set of rules, and that the data can accounted for with a far more constrained set of rules (or parameters).

2.3.2 Rules and parameters

Besides its consideration of syllable structure, and its use of a hierarchical representation for prominence, metrical phonology is set off from the SPE approach by its use of principles and parameters, in addition to rules (e.g. H&V) or

instead of them (e.g. Dresher & Kaye 1990). In a principles and parameters framework, which is now the dominant approach to the study of syntax, under the appellation Universal Grammar, language learners are seen as being innately equipped with a set of universal principles, and unset language-specific parameters. The parameters, which are usually assumed to be binary, are set to the proper value for the language being learned when the appropriate evidence is encountered. There are at least three important advantages of this approach for the study of language acquisition. First, the existence of principles and parameters is seen as helping to explain the rapid and, with few exceptions, uniformly successful, progression of first language acquisition, since the learner does not have to induce complicated rules from the less than perfectly regular language encountered, but instead only has to choose from a relatively limited number of parameter settings. Secondly, it is far easier to produce an explicit theory for the setting of parameters than for the induction of rules (though this is still by no means a facile task as will be seen in the following chapter). Thirdly, a comparison of the parameter settings across languages can offer intriguing hypotheses about the course of second language acquisition.

For these reasons, and because of the greater explanatory value of a constrained theory, an account of stress phenomena relying only on a small set of universal principles and parameters would appear to be preferable to one which posits

a large set of ad hoc language specific rules. The principles and parameters approach does not, however, enjoy the same status in phonology as it does in syntax, where rules have been effectively eliminated. While H&V adopt a parameterized approach to the 'core' of metrical theory, they avail themselves of a wide variety of devices, including extrinsically ordered rules, on the 'wild periphery', as Dresher (1989), who provides a critique of H&V from a learnability standpoint, has aptly described it. In a postface, H&V justify the continued use of ordered rules in phonology by speculating on the differences between syntax and phonology. However, it remains an empirical question to what extent such rules can be replaced by more explanatory principles in the realm of phonology.

H&V's account of English stress, in particular, rests on a number of extrinsically ordered rules added to their basic set of principles and parameters for grid construction. To my knowledge, there does not exist a competing principles and parameters based analysis of English. In the next section, I will attempt to provide such an analysis, using H&V's bracketed grid representation, and their basic principles of grid construction, but with a modified set of parameters. These parameters are adopted from Dresher and Kaye (1990) (D&K), with a few alterations, both to suit the grid formalism (D&K use trees) and to account for the English data. This discussion will be confined to the cases of monomorphemic

words, since suffixation plays a special role in English stress.

2.3.3 A parameter based account of English stress

Languages differ along several parameters for stress assignment. The first is the direction of the parsing of the word into feet. English words are parsed from the right to left. Secondly, languages differ as to whether they construct binary (bounded), or unbounded feet. Binary feet group the syllables into pairs, sometimes allowing monosyllabic, or 'degenerate' feet, while there is no restriction on the size of unbounded feet. English feet are binary, thus creating the characteristic alternating pattern of stress. As well, feet are either iterative or not. Iterative foot construction parses words into several feet, while noniterative parsing creates just one foot. English foot construction is iterative. Next, feet can be either strong on the left, or strong on the right. English feet are strong on the left, so the feet are described as left-headed. These heads are usually realized phonetically as subsidiary' stresses. One of the heads of the feet is marked as receiving main stress, which is done by the 'word tree' in arboreal theories (Hayes 1982, D&K), the End Rule in some grid variants (Prince 1983, Hayes 1987), or by the grouping of the foot heads by bracketing, and the marking of a head at the right edge (H&V). In any case, the rightmost head of the feet becomes the most prominent syllable. Lastly,

languages can create an extrametrical unit at the edge of the word. Extrametricality specifies that a given unit is rendered 'invisible' to the foot building process. English has an extrametrical syllable at the right edge of nouns and suffixed adjectives, so long as that syllable contains a short vowel. All of the words in the SPE columns above have extrametrical syllables.

The above basic parameter choices for English are quite uncontroversial[2]. To show how they operate in the construction of a grid, one will be built for the long but unexceptional word hàmamèlidánthemum in (8).

(8)

Stage 1-Stress Bearing Unit Projection, Extrametricality

Project line 0 asterisks from all units that can bear stress (all syllables in English), mark the rightmost syllable of nouns and unsuffixed adjectives as extrametrical /<.>/.

```
line 0  * * * * *    *<.>
        hamamelidanthemum
```

Stage 2-Line 0 bracketing, Head Marking (Subsidiary Stress)

Group the line 0 asterisks into bracketed binary feet, mark the left members of the pairs (the heads) on line 1.

```
line 1  *     *     *
line 0 (* *)(* *)(*    *)<.>
       hama meli danthe mum
```

Stage 3-Line 1 Bracketing, Head Marking (Main Stress)

Group the line 1 asterisks into an unbounded constituent structure, mark the rightmost one as the head on line 2.

```
line 2              *
line 1 (*     *     *)
line 0 (* *)(* *)(*    *)<.>
       hama meli danthe mum
```

2.3.3.1 Syllable weight and English stress

Hamamelidanthemum contains a penultimate light syllable, and so would be categorized along with the America-type nouns in column 1 above, with a stressed antepenult. As has been discussed, a heavy syllable in the penultimate position attracts stress, in words such as agenda, and aroma. This phenomenon is handled in earlier work by Halle & Vergnaud (1978), Hayes (1982), and in D&K by the creation of a quantity sensitivity parameter stating that a branching rime is forbidden to appear at the weak side of a foot. The action of this parameter forces the penultimate syllable to be marked as strong (tree) or a head (grid), as it is not allowed to be marked as weak, or a dependent.

This immediately creates a complication for the analysis of English stress, since subsidiary stress is generally not sensitive to quantity, as is shown in words such as anecdotal, where there is an unstressed (non-extrametrical) syllable with a branching rime. This led Hayes (1982) to posit separate stress assignment processes for main and secondary stress, the latter following the former. The main stress foot construction process would be non-iterative and quantity sensitive, and subsidiary stress assignment iterative and quantity insensitive. He adduces further evidence for this move from

the apparent dependency of subsidiary stress placement on the position of the main stress, with the subsidiary stresses falling on every other syllable starting from the main one.

H&V use a different mechanism for explaining the appearance of stress on the heavy penults. They invoke an 'Accent Rule' that projects a line 1 asterisk from all syllables with branching rimes. This marks the syllables as heads, and bracketing obligatorily places them at the left edge of feet. H&V follow Hayes, however, in assuming two separate processes for main and subsidiary stress, labelling them the cyclic and non-cyclic strata respectively. In the cyclic stratum, the Accent Rule operates after Stress Bearing Unit Projection to give prominence to the heavy syllables. Otherwise, the cyclic rules are essentially the same as those given in (8). At the end of the cyclic stratum comes a rule of Stress Conflation, that conflates line 1 and line 2, eliminating the line 1 asterisks given to heavy syllables, except the one that has been assigned main stress, since it is protected by a line 2 asterisk. In the non-cyclic stratum the same set of rules, with the exception of Extrametricality and the Accent Rule, come into effect again to assign the subsidiary stresses. Also present in the non-cyclic stratum is a Stress Deletion Rule, a Stress Enhancement Rule and several other ordered rules needed to tidy up the output so as to generate the correct surface patterns.

To illustrate the effects of H&V's rules for English

stress, a grid for hamamelidanthemum, and for Apalachicola, a word with a heavy penult, is shown in (8). Numbers correspond to the stages listed in (8), with the exception that the Accent Rule is incorporated into stage 1 as part of the lexically based projections onto the grid. SC stands for Stress Conflation, which marks the transition from the cyclic to the non-cyclic stratum.

(9)

```
            *                 *    *    *          line 1
    * * * * *   *<.>         (* *)(* *)(*   *)<.> line 0
1-> hamamelidanthemum -2-> hama meli danthe mum

                *                              *          line 2
    (*    *    *)                           (*)         line 1
    (* *)(* *)(*   *) <.>          * * * *(*)  * <.> line 0
-3-> hama meli danthe mum -SC-> hamamelidanthe mum

                *          line 2
    (*    *    *)  *      line 1
    (* *)(* *)(*) (*  *) line 0
-2-> hama meli danthe mum


                                                  *     line 2
           *      *    *     *      (*    *     *)     line 1
  * * *  * *<.> (* *)(*  *)(*)<.>  (* *)(*  *)(*)<.> line 0
1->Apalachicola-2->Apa lachi co la-3->Apa lachi co la

                *                     *    line 2
               (*)      (*    *      *)   line 1
      * * *  *(*) *    (* *)(*  *)(* *) line 0
 -SC-> Apalachico la -2->Apa lachi  cola
```

The difference in the stress patterns of these words is explained in this formalism by the projection of a line 1 asterisk above the heavy penultimate syllable of Apalachicola in the first stage. The bracketing then obligatorily places the penultimate syllable in head position, thus creating a monosyllabic foot, as there are no dependents to its right, so

long as the final syllable is extrametrical.

As is apparent from a comparison of the derivations of hamamelidanthemum given in (8) and (9), the separation of the main and subsidiary stress application processes into individual strata adds considerable complexity. Also, as Durand (1990: 240) points out, the rule of Stress Conflation is a powerful mechanism to include in a grammar since it does not preserve structure. Such lack of structure preservation may create a rule that is unlearnable, for as Dresher (1989: 184) notes, "the rules of metrical construction must be recoverable by a learner, no matter what distortions they might undergo in the course of a derivation." If syllable weight played no role in the assignment of subsidiary stress such a move might be unavoidable. However, there is evidence that syllable weight does have an important function in subsidiary stress placement. Hamamelidanthemum in (9) has a misplaced penultimate line 1 asterisk generated in the non-cyclic stratum. This asterisk is removed by a rule of Stress Deletion, that affects any syllable adjacent to one with greater stress, deleting its line 1 asterisk. H&V note that this rule applies too broadly, though, since heavy syllables in these positions remain stressed, as in the case of bàndana (as opposed to banána), and propose that heavy syllables are exceptions to this rule. Thus, H&V are forced to make reference to syllable weight (or in their terminology, rime branchingness) in both the cyclic and non-cyclic strata. It is

also worth noting that the dependency of subsidiary stress on main stress is by no means a necessary assumption. As is shown in stages 1-3 (preceding Stress Conflation) of the derivations of hamamelidanthemum and Apalachicola in (8), which happen to produce the correct surface representations for these words, the placement of main stress (line 2 asterisk) is actually dependent on the prior placement of subsidiary stress (line 1 asterisks). Thus H&V in effect assume both directions of dependency.

2.3.3.2 A unitary metrical grid construction

A more parsimonious set of assumptions would be that there is a unitary process of grid construction for underived words, that the assignment of primary stress is dependent upon the prior placement of subsidiary stress, and not the reverse, and that syllable weight is only used as the basis of the preliminary assignment of prominence. Adopting such assumptions, the problem one is immediately forced to confront is how to account in a principled manner for the disappearance of line 1 asterisks above some heavy syllables. Notably, there is a significant tendency for the creation of monosyllabic feet only at the edges of the stress domain. This is depicted by the words in (10).

(10)

*	*	*	*
(* *)	(* *)	(* *)	(* *)
(* *)(*)<.>	(* *)(*)<.>	(* *)(*)	(* *)(*)
a. invo cation	exci ta tion	anecdote	cavalcade

```
        *           *           *           *
    (*   *)     (*   *)     (*   *)     (    *)
    (*)(*)<.>   (*)(*)<.>   (*)(*   *)<.>  (*)(* *)<.>
b.  vo cation    ci tation   cantanke rous   A meri ca
```

In (10a), the line 1 asterisks initially assigned to the underlyingly long second syllables in invocation and excitation, and to the closed second syllables of anecdote and cavalcade have been removed. In contrast, the line 1 asterisks of the initial syllables of vocation, citation, and cantankerous have all been preserved, by the creation of monosyllabic feet. In addition, since the extrametrical syllable is considered outside of the stress domain, all of the above words but cantankerous and America have heavy syllables and monosyllabic feet at the right edge.

One can formally account for these alternations by positing a bracketing constraint (or a foot-size constraint) that allows monosyllabic feet at the edges only. Such a constraint would place the medial heavy syllables in (10a) on the right edge of the feet, which is by definition the dependent position. A probably universal prohibition against stressed non-heads would result in the removal of line 1 asterisks from syllables in this position. This constraint would be incorporated into Stage 2 of the grid construction, which can be now reformulated as in (11).

(11)

Stage 2-Line 0 Bracketing, Head Marking

> Group the line 0 asterisks into bracketed maximally binary feet, with the constraint that monosyllabic feet

are only permitted at the edges of the domain. Feet are left-headed. Remove line 1 marks from non-heads, and assign line 1 marks to heads.

While, as far as I am aware, such a bracketing constraint has not been proposed before, it would seem to be a natural result of the tendency of languages like English to prefer a pattern of alternating stress, sometimes called eurhythmy, that is also assumed to be the motivator of the above mentioned Rhythm Rule (see Durand (1990: 233) for discussion).

Cantankerous and America, as well as banana and bandana, illustrate the alternation between headed and headless initial monosyllabic feet[3], in which heavy syllables surface with line 1 asterisks and light ones do not. This can be accounted for as the result of a clash filter (12) that comes into effect after the initial lexical projection onto the grid. This too can be regarded as a result of the eurhythmic tendencies of English, in that it blocks the creation of adjacent stresses. In this notation, given in Myers (1991), who attributes the concept of the filter to Prince (1983), a star represents a disallowed representation. The effect of a filter is to simply block the placement of the asterisk, in contrast with a persistent rule which would remove such offending structure (Myers 1991).

(12)

Clash Filter (After Stage 1)

* * * ,where * * dominate adjacent syllables

This procedure of metrical grid construction for English

produces extremely straightforward derivations. To illustrate its application, (13) shows the stages of grid-building for several of the words discussed above. Again, the numbers correspond to the stages as they have been outlined.

(13)

```
                                              *      line 2
      *  *          *    *          (*     *)     line 1
    * *  *<.>     (* *)(*)<.>     (* *)(*)<.> line 0
1-> anecdotal -2-> anecdo tal -3-> anecdo tal

                                                 *       line 2
     *  *               *  *               (*  *)       line 1
     *  *  *<.>       (*)(* *)<.>       (*)(* *)<.> line 0
1-> cantankerous -2-> cantankerous -3-> cantankerous

                                 *
                     *          (*)
    * * *<.>     (*)(* *)<.>     (*)(* *)<.>
1-> America -2-> A meri ca -3-> A meri ca
```

Anecdotal shows the preservation of the domain-final line 1 asterisk by the creation of a monosyllabic foot. However, the medial line 1 syllable cannot be preserved by the same means, due to the bracketing constraint. As it is placed in dependent position, the line 1 asterisk obligatorily disappears, to be replaced by one in the head position. In cantankerous, both initially projected line 1 asterisks are preserved, since one is at the left edge of the domain, and the other falls in the head position of a binary foot. America contrasts with cantankerous in that the first syllable is light, and does not initially project a line 1 asterisk. In stage 2 head marking, the marking of the head of that syllable is blocked by the prior marking of the adjacent head, and the operation of the

clash filter.

There remain several classes of putative and real exceptions to this account, but these are best discussed elsewhere. The point to be made here is that it is possible to explain the stress patterns of the vast majority of English words on the basis of a constrained set of parameters, with the addition of the bracketing constraint, and the clash filter, both falling out from the eurhythmic quality of English. It remains to be seen whether the bracketing constraint and the clash filter play a role in the grammars of other languages with iterative binary feet. There is no extrinsic ordering needed in this account, with the possible exception that the clash filter must be formulated so as not to block stress bearing unit projection or heavy syllable projection (Accent Rule). The parameter choices are presented in summary in (14).

(14) Parameters of English Stress Assignment

Parameter	English Setting
P1: Feet are [Binary/Unbounded]	Binary
P2: Feet are built from the [Right/Left]	Right
P3: Feet are strong on the [Right/Left]	Left
P4: Heavy syllables project head markings [Yes/No]	Yes
P5: Word level prominence is [Right/Left][4]	Right
P6: There is an extrametrical syllable [Yes/No]	Yes
P7: It is extrametrical on the [Right/Left]	Right
P8: Feet are noniterative [Yes/No]	No

The availability of such a parameter based explanation for English stress clears the way for the discussion of the questions that are the focus of the next section, as well as the rest of this study; how are the parameters set, in both first and second language acquisition?

Notes for chapter 2

1. In this paper, no position is taken on whether the phonological description of English stress should involve reference to two, three, or more degrees of stress, so the neutral term 'subsidiary' is used exclusively (Schane (1979) makes an argument for two, H&V assume 3).

2. That H&V's parameters for grid construction are quite different from the ones assumed here requires some comment. Central to H&V's theory is the parameter that defines whether feet are +/- Head Terminal. This parameter is made necessary by the existence of a few languages having bounded ternary feet, of the following shape:

```
    *
(* * *)
```

Dresher & Lahiri (1991) provide a reanalysis of one of the 'ternary-footed' languages that keeps the simple binary and bounded vs. unbounded distinction intact. As this issue is somewhat orthogonal to those at hand, the more traditional parameters have been used, since they are more clearly relevant to English (and French) stress assignment.

3. Prince (1992) and H&V argue against the existence of headless feet, which are explicitly assumed by Hayes (1987). As far as I can tell, either position is an a priori one, for which there is no clear evidence. H&V's Faithfulness Condition (p. 16) would simply erase the constituent boundaries between the headless foot and its neighbour, creating the following output representation for America:

```
     *
    (*)
(*  * *)<.>
 A meri ca
```

One possible argument against this move is that it creates a ternary foot, otherwise absent from English, and possibly all other languages as well (see note 2). As headless constituents are recognized in syntax, there doesn't seem to be any reason not to admit them to phonology.

4. To follow H&V strictly, this parameter would be replaced by a group of settings for line 1 constituent bracketing and head location on line 2. In contrast, Hayes (1987) argues that all prominence assignment at a level higher than that of the foot can be attributed to Prince's (1983) End Rule, with a language specific choice of whether the right or left end is chosen as

prominent. Within H&V's framework, Hayes' claim would be translated as saying that bracketing on line 1 (foot level) is always unbounded. In the analyses of stress systems presented by H&V, the line 1 parameter setting is always [-bounded], with the exception of their account of Odawa, in which [+bounded] line 1 bracketing is followed by [-bounded] line 2 bracketing. Again, pending further discussion of this case, the more traditional [right/left] parameter will be retained.

Also to be noted is the fact that Extrametricality and the Accent Rule are rules rather than parameters in H&V's account. However, Ohsiek (1978: 35) found that at least 30 of 140 languages in the Stanford Phonology Archive make use of quantity sensitivity, while Hayes (1982) shows that phenomena across a number of languages can be explained with extrametricality. This provides some justification for their being referred to as parameters. See Dresher (1989) for some further support for quantity sensitivity as a parameter.

3. On the setting of metrical parameters

3.1 Introduction

The theoretical and experimental study of the setting of metrical parameters is quite underdeveloped, especially in comparison with the study of the acquisition of syntactic parameters (see White 1989a for an overview of the work done on syntactic parameter setting in second language acquisition). The purpose of the present chapter is to discuss some of the fundamental issues in the construction of a theory for metrical parameter setting, which have been raised in Dresher and Kaye's (1990) account of a computational model for the learning of stress (hereafter D&K). Following that, the small body of literature that does exist on the learning and use of stress rules, done originally outside of the framework of metrical phonology (with the exception of Hochberg 1988a), will be critically evaluated in order to determine its implications for a theory of parameter setting. The chapter will be concluded with a discussion of the second language literature.

3.2 Dresher and Kaye's learnability study

The question addressed by D&K is that given the language that the learner is exposed to (the data), and a set of innate principles and parameters (Universal Grammar), how does the learner set the parameters so as to arrive at the grammar of the language being learned? They argue that to explain this process, one must develop a learning theory complementing the

theory of Universal Grammar. In essence, this learning theory describes the relationship between the data and the parameters. To develop an explicit learning theory, D&K constructed a computer program that sets the parameters on the basis of data from a number of languages. D&K emphasize that the existence of a computer program for the setting of parameters does not entail that their learning theory is correct. In developing this program, however, they were forced to deal with several issues that one must confront in the analogous construction of a theory of human parameter setting.

3.2.1 The incremental and batch modes

A central issue in D&K's enterprise was to decide how much data the "learner" should have access to in setting the parameters. One approach would be to have a learner with access to the parameter settings, with the data being presented one word at a time so that it simulates a stream of speech. D&K term this the incremental mode learner. Such a learner would not be able to make comparisons across words, but would only be able to set parameters on the basis of the word being processed at the time, as well as the parameter settings current to the processing of the word. D&K note that this type of learner "appears to mirror the situation of the child" (p. 171). The other approach discussed by D&K is that of supplying the learner with all the data at once. The learner would then be operating in the batch mode. As they

remark, this mode approaches the idealization of "instantaneous acquisition" assumed by most generative linguistic theorists, including Chomsky and Halle (1968).

Of these two approaches, the more constrained, and probably more similar to child language acquisition, is the incremental mode learner. However, D&K are forced to adopt the batch mode learner partly because the incremental mode learner is not powerful enough to set the parameters correctly. They illustrate the problem with the example of the quantity sensitivity parameter (QS). The definition of quantity sensitivity assumed by D&K is that a heavy syllable is forbidden to appear on the weak side of a foot, and must therefore be stressed[1]. A QS language is, in terms of the syllable types permitted, a subset of a quantity insensitive (QI) one. That is, a QS language can have heavy and light stressed syllables, but only stressless light ones. A QI language, on the other hand, permits heavy and light syllables, both stressed and stressless. A subset relationship between parameter settings is considered significant because of arguments that learning must follow the subset principle (Berwick 1985 and Wexler & Manzini 1987)[2]. This principle is based on the widespread assumption that language learning proceeds on the basis of positive evidence only. As all of the evidence for the subset is consistent with the superset, no amount of positive evidence could force a resetting to the subset once the superset setting had been adopted. Because of

this, the subset parameter setting is regarded as the initial, unmarked one, with learning proceeding from that setting to the sup set, marked setting, and never the reverse. Given these assumptions, the language learner must assume an unmarked setting of QS, and move to the QI setting upon encountering a stressless heavy syllable.

Using the lack of stress on a heavy syllable as the cue for the setting of the QS parameter is problematic, however, given that factors other than being in a weak metrical position, such as extrametricality, non-iterative foot construction, or destressing may cause a heavy syllable to be stressless. Because of this consideration, a strictly syllable-based cue will probably not suffice to set the QS parameter. The only other option, it would appear, is to allow the learner access to cross-word comparisons, so that when words identical in number of syllables, but differing in stress placement and syllable weight, are encountered, the learner would set the parameter to [+QS]. In this case, as D&K emphasize, the subset relationship is reversed. All else being equal, for a word of a certain number of syllables, a QI language has only one stress pattern, whereas a QS system could have a variety of patterns, depending on the weights of the syllables.

D&K opt for the batch mode in order to give the learner the ability to make cross-word comparisons, since the incremental mode learner can not make reference to more than

one word at a time. They note that the human language acquisition equivalent of this choice is the assumption of "a latency period during which the learner stores input, without attempting an analysis" (p. 172). It is of course absurd to assume that a child stores input until all the data have been presented, since there is no such thing as "all the data" from a language, and if there were, the child would have no way of knowing whether all the data, or all the data but one word, had been encountered. However, it is not unreasonable to assume that there is a period of "lexical storage" during which the learner stores the stress patterns of the words lexically, without setting the parameters, and that the parameters are only set after a certain amount of evidence has been acquired[3].

3.2.2 A note on other learnability considerations

The lexical storage/incremental learning distinction is to a certain extent tied up with questions of markedness and subset relationships, and with the problems posed by exceptions. D&K note that when one takes the position that learning is strictly incremental, "the choice of the unmarked parameter value is absolutely crucial" (p. 165), given that positive evidence can never force a switch from the superset to the subset. However, if the learner has access to a substantial body of data, this choice is perhaps less significant, since the absence of a cue in the data could

become positive evidence. Given lexical storage, one might even argue that either setting of the parameter requires positive evidence[4], in the absence of which the parameter remains 'dormant'.

Also, the existence of exceptional forms poses a particularly severe problem for the incremental learner, since in the absence of cross-case comparisons there could be no awareness of whether an item is common or rare, without the addition of some extra mechanism, such as a counter keeping track of how many instances of a certain cue had been encountered. Exceptions are troublesome in a parameter setting model since a superset setting might be chosen on the basis of an exceptional word. D&K present some possible solutions within the incremental framework (p. 188 ff.), including the 'counter' mechanism, as well as the speculation that exceptions might always be cues for the unmarked, rather than the marked setting (though this latter solution strikes one as an exercise in wishful thinking). Within a lexical storage framework, however, the problem is less severe, as individual occurrences of cues are not seen as offering sufficient weight to set the parameter.

The main theoretical problem for a lexical storage model would be to specify how and when this accumulation of evidence eventually sets the parameter. This is not dealt with by D&K, since the batch mode presents all of the data at once.

3.3 Empirical evidence on metrical parameter setting

Certain questions about the nature of parameter setting, such as what type of cue is used to set the parameter, as in the above discussion of whether a purely 'local' syllable-based cue could set quantity sensitivity, are not germane to empirical investigation, and must be addressed on purely theoretical grounds[5]. It is interesting, though, that on the basis of theoretical considerations of this kind, D&K chose a learning model whose fit to the 'real world' can be measured empirically. That is, one could investigate whether human learners do go through a stage during which they use stress on individual words, but have no preference for particular stress patterns, or whether they demonstrate preferences right from the beginning of their use of stress. The first situation would constitute evidence for what can be termed the lexical storage hypothesis, while the other would tend to indicate that a more strictly incremental learning process is taking place.

Though a lexical storage hypothesis has never been discussed in terms of a parameter setting model for the learning of stress, there has been some research done that bears directly on it, as well as on the issue of unmarked parameter settings. The existence of unmarked parameter settings would be important for the study of language acquisition, not only because of its relevance to the incremental/lexical storage issue as outlined in the above

paragraph, but because it would affect the sorts of hypotheses one might make about the course of first and second language acquisition (cf. White 1989a).

The subject of much discussion, and the first hypothesis about the learning of word stress of which I'm aware, is the claim made by Allen and Hawkins (1979, 1980), and Allen (1982) that young children have an innate trochaic bias. In metrical phonology, as well as in the study of classical metrics, or poetic rhythm, from which much of the vocabulary of metrical phonology has been derived, a trochaic foot refers to a binary grouping of syllables in which the first syllable is the accented member of the pair (see Hayes 1987 for a typology of feet). In Allen and Hawkins' terminology, however, a trochaic bias is taken to refer to a falling accentual pattern of any size. Allen and Hawkins' claim would be translated into a parametric framework as stating that [left] is the unmarked setting for the parameter that determines whether a foot is strong on the left or right (P3 in 2.3.3.2)[6]. Notably, the subset principle does not make any predictions for this case, since the parameter choices produce discrete sets.

Allen and Hawkins' trochaic hypothesis has been disputed by other researchers, either explicitly (Hochberg 1988b, Pollock, Brammer & Hageman 1989), or implicitly (Klein 1984). They all argue that children have no innate bias, and that the early production of stress is driven by the lexicon rather than by rule. In what follows, the evidence that Allen and

Hawkins marshal in support of their claim will be discussed, as will the counter-examples provided by the others.

3.3.1 Evidence for the trochaic hypothesis

Allen and Hawkins present a variety of data in support of their hypothesis. The first published paper on the subject, Allen and Hawkins (1979), presents a survey of previous literature, while Allen and Hawkins (1980) and Allen (1982) include original experimental data.

In Allen and Hawkins (1979), all of the child language data come from various observations of natural production, such as the Smith (1973) and Leopold (1939) diary studies. They note that in Amahl Smith's 200-word lexicon, about 90 % of the words are produced with a falling accent, while Hildegaard Leopold's lexicon of a similar size contains 80 % of such forms. In the case of Amahl, the language spoken was primarily English, and his words almost always reflect the accentual contours of the adult forms. Allen and Hawkins' claim, however, is that the trochaic bias is manifested as a selectional tendency, and that even though in English the apparently vast majority of nouns and adjectives of two or three syllables, which form the bulk of Amahl's vocabulary, are initially stressed, "the observed selectional bias goes far beyond the statistics of English" (p. 928). No statistics are presented, however, so it is difficult to evaluate their claim that Amahl is choosing words according to their

accentual pattern. One would hope for a more forceful argument for such a method of building the lexicon, since the intuitive hypothesis would be that children choose words on a semantic, rather than accentual, basis. Similar criticisms apply to the case of the bilingual Hildegaard, since stress in German, her other language, is usually initial.

Allen and Hawkins also discuss cases of non-target-like productions. In English, they contend, chidren's disyllabic reduplicated forms are always trochaic, as are their disyllabic productions of trisyllabic medially stressed target forms (i.e. nána or bána for banána). Again, no statistics, or citations are presented, but even if we assume that these claims are valid, they do not form very strong evidence for an innate bias. Since the statistical tendency in English for short nouns and adjectives would seem to be toward initial stress, it could well be the case that the parameter for headedness of feet is set to the left on the basis of positive evidence. A stronger indication of an unmarked parameter setting would be the use of that setting in a language that has the marked setting, such as in Hyams (1986), where it is argued that the pro-drop parameter is used in its unmarked, positive setting by children learning English, a non-pro-drop language. Unfortunately, Allen and Hawkins uncover no evidence of such phenomena. In the case of reduplication, they report French children using final stress, as in the adult language. Also using ultimately stressed reduplication are children

learning Brazilian Portuguese (Stoel-Gammon 1976) and Comanche (Casagrande 1948), the adult languages having penultimate stress and initial stress respectively. The evidence from reduplication then, is not at all supportive of the trochaic bias. As for the disyllabic production of longer forms, they find only sparse and contradictory evidence. On the whole, as Allen and Hawkins (1979: 931) note themselves, the cross-linguistic evidence is "unimpressive", as is, one might add, the English data in terms of the light it sheds on the question of an unmarked tendency.

Other evidence cited by Allen and Hawkins in both their 1979 and 1980 papers is the overwhelming tendency toward the use of trochaic patterns in nursery rhymes in most languages but French. As they emphasize, this is only suggestive of an innate bias since nursery rhymes are produced by adults. What this is probably more suggestive of, however, is some sort of unmarked rhythmic form, that manifests itself in the poetic rhythm of the nursery rhymes, and that words are chosen to fit this metre. That this unmarked rhythm would in turn determine an unmarked parameter setting for linguistic accentuation is a possible but by no means necessary conclusion.

In search of more conclusive evidence for the trochaic bias, Allen and Hawkins (1980) designed a 'wug test' (Berko 1958) in which three pairs of 'animals' were given made-up names. Each member of a pair had the same name in segmental terms, and differed only in the initial or final placement of

stress. Six children, aged 3:7 to 6:9, were engaged in a task in which they were in essence required to repeat the names of the animals. Scores were calculated on the basis of how often the children misstressed the target word. Yet again without providing enough figures to assess their claims (i.e no overall numbers, and results only for some of the children), Allen and Hawkins (1980: 250) conclude that "there is indeed a bias in young children's speech away from words with rising accent and/or toward words with a falling accent."

There are, however, several serious design flaws in this study. First and foremost is the segmental composition of the nonce words. They used just three nonce words in the study, only one of which, /ta.ki/, appears to be unproblematic. /gwa.vi.stru/ and /smIp.fo/ contain consonant clusters that are quite rare in English. /gw/ appears only in proper names of Welsh origin such as Gwyn and Gwen (Durand 1990: 18). There is an absolute restriction on initial labial clusters, while medial ones, such as the /pf/ of /smIpfo/, are also unusual, usually occurring only in compound or suffixed words. Both Klein (1984) and Hochberg (1988b) found that children tend to emphasize syllables that present difficulties at the segmental level. One wonders how many of the finally stressed items that were pronounced as initially stressed were in fact instances of the phenomenon reported by Klein and Hochberg. The age of the subjects is also troublesome. Since English is a language with trochaic feet, all they have succeeded in showing, if

anything, is that the chidren have made some generalization to that effect. Finally, as Hochberg (1988b) points out, the behaviour of the two youngest subjects seems to be in direct contradiction to the trochaic hypothesis. The fact that they show a preference for finally stressed forms is explained by the investigators as being a result of their having interpreted these words as unusual, which is a less than entirely convincing dismissal of these results.

Also less than convincing are Allen's (1982) claims of having observed a trace of a primitive trochaic bias in the speech of French 2 year olds. In this experiment, various words in isolation were elicited using a picture naming task. As Allen (1982: 120) remarks, in adult speech, "the last syllable of the [French] phrase is produced with greater duration, lower Fo [frequency measure], and slightly decreased intensity". Thirty-seven of the total 181 utterances that were produced by the children had a greatly reduced intensity on the last syllable, which Allen describes as evidence for the trochaic bias. These could be the result, however, of the children's exaggerated replication of the adults' models, since if the child could not name the picture, the tester provided the word as a cue. Another confounding variable in this study is the fact that the dialect spoken by the children and the tester is that of Aix-en-Provence. In the south of France, the final e, usually referred to as 'mute e' in standard French, is often pronounced as a scwha. The presence

of this final schwa would result in a falling intensity contour. Allen does not state whether this was controlled for in his study.

Even more striking than the number of widely falling intensity contours is the fact that the intensity contours are distributed almost evenly throughout the spectrum from wide fall to wide rise, with a few more in the categories corresponding to the adult norms. The numbers for Fo contours are grouped similarly, but with a greater number of 'normal' contours. Such variability, rather than indicating production constrained by innate bias, would seem to be more in line with a hypothesis that these children's responses are constrained only by their knowledge of the words, and that the less normative randomly distributed responses are the result of repeating unknown words. As Allen provides no statistics on the relative accuracy of known and repeated words, this remains in the realm of speculation. Some evidence that it may indeed be the case, however, is found in Klein (1984), to which we now turn.

3.3.2 Counter evidence to the trochaic hypothesis

Klein (1984) conducted a case study of the speech of an approximately 2-year-old child in order to investigate the learning of stress. In her study, the polysyllabic words produced by Peter, from whom taped samples of speech were collected in an earlier study by Bloom, Hood and Lightbown

(1974), were analyzed for the placement of primary stress. As in the study by Bloom et al., words were categorized according to whether they were produced spontaneously or as imitations of adult models. She found that the familiar, spontaneously produced words were stressed much more consistently and correctly than unfamiliar, imitated words. This is seen as supporting "a view of lexical primacy during the early stages of learning word stress" (Klein 1984: 375). The strength of this claim is somewhat mitigated, however, by the fact that the misplaced stress patterns were correlated with articulatory difficulty. Rather than a lexical storage account, one might propose that the acquisition of the phonemic representation of a word is a prerequisite for the application of stress assignment parameters. To counter this latter hypothesis one would need clear evidence that new words which present no challenge at the segmental level are stressed inconsistently, according to the relevant parameters.

Evidence of this kind is provided in an experimental study by Pollock, Brammer & Hagemen (1989). The focus of their study was an investigation of the use of the various acoustic features correlated with adult stress placement (viz. intensity, fundamental frequency, and duration) by chidren from the ages of two to four. They were interested in discovering the order in which these features appeared to be controlled by the children, as well as whether the initial or final placement of stress affected the way these features were

used. As in the Allen and Hawkins (1980) study, nonce words were used, elicited from the children in an object naming task. Unlike that study, however, the segmental composition of the words was carefully controlled, with only CVCV forms being used. In their discussion, they note that the changes in stress placement produced by the two year olds were not made consistently in one direction, but that finally stressed versions of initially stressed models were produced as well as the reverse. Unfortunately, no statistics are presented, nor are results bearing on this issue for the older children, since the trochaic hypothesis was not the focus of their study.

Hochberg (1988b) also presents empirical data from learners of Spanish that she claims argue against the trochaic bias. However, her interpretation of Allen and Hawkins' hypothesis seems not to be entirely accurate. Her study is based on the premise that if the trochaic bias is operative, penultimately stressed words should be more accurately produced than finally stressed ones. While penultimately stressed words in Spanish are generally analyzed as having a trochaic foot at the right edge, Allen and Hawkins' hypothesis does not refer just to the trochaic foot, but to any falling pattern. In their 1980 paper, they state that the term 'falling pattern' can be interpreted as initial stress (p. 246). Also the versions of /gwavistru/ tested were the initially and finally stressed ones, and not the penultimately

stressed form. Thus, Hochberg's demonstration of a lack of favour for penultimate stress is not necessarily evidence counter to the trochaic hypothesis, since only some, but not all, penultimately stressed words used by her subjects are bisyllabic and thus initially stressed.

Within second language acquisition research, the only evidence relevant to a lexical storage hypothesis that I have come across is almost anecdotal. An instrumental phonetic study was carried out by Flege and Bohn (1989) with Spanish learners of English to investigate the ordering of the phenomena of vowel reduction and stress placement. They noted that though word familiarity was not controlled for, it seemed to be the case that non-native speakers "produce more familiar (or high-frequency) words, like able-ability more authentically than less familiar words" (Flege and Bohn 1986: 60). They also urge further research into this hypothesis, for the light it would shed on the nature of the acquisition of second language stress placement and vowel reduction.

3.3.3 Beyond lexical storage

While far from conclusive, the evidence does seem to support a view that there exists a stage during which the learning and use of stress is not constrained by parameters, but is instead lexically based. Evidence put forth for the trochaic bias, on the other hand, is far less persuasive. The obvious question at this point is that if metrical parameters

are not required for the acquisition of the stress patterns of words, why posit productive metrical parameters at all? In syntax, parameters have been conceived as devices that facilitate learning by constraining the possible choices that a learner will make in constructing a grammar. This sort of constraint is necessary due to the problem of underdetermination. That is, a grammar "goes far beyond the actual sentences that a learner may happen to have been exposed to" (White 1989a: 5). However, it is not immediately apparent that the knowledge of word stress goes beyond the evidence presented to the learner, since a word that has been learned has necessarily been heard before[7].

This question is in fact raised by Selkirk (1980). She argues that since words enter the lexicon already stressed, the internalized knowledge of stress needs only to consist of the patterns for individual words, plus a template determining the permissible patterns in the language, and that there is no need for productive stress rules. Selkirk's position is challenged by Hayes (1982), who cites three considerations in favour of the productivity of rules for stress: the role of the cycle, historical change, and experimental evidence. I will focus on the last two, for a discussion of the phonological cycle would be far too complicated to undertake here.

The experimental evidence cited by Hayes is that of Trammell (1978). In an investigation of the psychological

reality of underlying forms and stress rules posited in Chomsky and Halle (1968), Trammell asked native speakers of English to read unfamiliar learned Latinate, Greek, and Germanic words. He found a high degree of consistency in the assignment of main stress (87.1 % agreement). Further evidence for the parameter-based regularity of native speaker production of unknown forms is provided by the control subjects in the next chapter.

As pointed out by Hayes, words borrowed from another language tend to be regularized immediately (e.g. English pronunciations of Native American place names, such as Apalachicola), or over time (e.g. finally stressed English nouns borrowed from French often become initially stressed-bàyonét now has the variant báyonet). Another potential source of evidence for the operation of metrical parameters is the use of first language parameter settings for the stressing of words in a second language. Anecdotal evidence of this phenomenon is available to anyone who has spoken with a beginning second language learner. Perhaps because it is so common, the transfer of L1 stress rules has not been the focus of much empirical research. However, Anani (1989) shows that the incorrect placement of stress in all the English words produced by Arab learners can be attributed to first language rules for quantity sensitivity. Similarly, Archibald (1990) provides data on the production of English words by native speakers of Polish illustrating that the misstressed items

show the influence of the first language setting for the quantity sensitivity parameter.

Hayes concludes that stress is stored in the lexicon and generated by rules (and/or parameters). It seems reasonable to assume that there is an underlying system of parameters, that accounts for not only the above phenomena, but also why the stress patterns in a language are the way they are, why there are differences between languages, and why these differences are constrained in the way they are (see D&K for further arguments in favour of a parameter model). Lexical storage of stress patterns would be used in acquisition, as well as for the storage and use of exceptions.

3.3.4 When are the parameters set?

The empirical question raised at this point is quite parallel to the unanswered theoretical question posed at the end of section 3.2.2. Given a stage of lexical storage during the early period of learning stress, as well as a mature system of set parameters, at what point in between does the setting take place? There has been very little empirical work done that would allow an answer to this question. As was discussed in section 3.3.1, there is some evidence that two year old learners of English have a preference for initially stressed forms, that is demonstrated not only in their prevalently initially stressed lexicon, but also in their use of initially stressed disyllabic forms for medially stressed

trisyllabic words. Though this evidence is somewhat anecdotal in nature, it does not seem farfetched that English children of this age would have set one or more parameters in response to the overwhelming evidence that the shorter words they are using are stressed on the left edge. It is actually an empirical question, though, whether this would be accounted for as the setting of the parameter for headedness of feet or of words, or both, since a [left] setting of either would produce the same results in words that have only one foot. To investigate this question, as well to attempt to discover when the other English metrical parameters are set, one would need to undertake a careful study, preferably longitudinal, focussed on the acquisition of stress.

A methodological imperative in a study of metrical parameter setting would be to control for word familiarity, given the possibility that the stress pattern of any known word could be stored lexically. To do this, one might use nonce words, as in some of the forementioned studies. Hochberg (1988a) presents a cross-sectional developmental study of children from three to five years of age who were learning Spanish as a first language. In this study, real words were elicited through a picture naming task, and nonce words through a repetition task. Her conclusion from the study was that the process of stress-rule learning was essentially complete by age 3, since there were few age effects in her statistics. The strongest evidence for these children having

learned the stress rules is provided by the results from the imitation of the nonce words. There was a significant correlation between the number of imitation errors, and the degree of irregularity in stress placement in the model. There was also a significant tendency for errors to result in regularization, rather than in irregularization. Strangely though, while the spontaneous data also showed a greater percentage of errors on irregular words than regular ones, there was not the same tendency toward regularization. Hochberg (1988a: 697) notes that in this latter set of data "children were no more likely to regularize irregulars than they were to irregularize regulars". Her explanation for this, that the children had learned how to produce the exceptional words, does not provide much of an answer for why mistakes that were made on the irregular forms didn't tend more to regularization, so this finding remains somewhat mysterious.

On the basis of such scanty evidence, one is loath to make any conclusions. However, what evidence there is does seem to point to fairly early first language setting of the parameters for stress[8]. For second language learners, however, the metrical parameter setting operation is probably neither as quick nor as certain. In fact, given the controversy over whether Universal Grammar continues to operate in second language acquisition (for arguments for, see White 1989a, and against, Bley-Vroman 1989), it is perhaps debatable whether second language parameter (re)setting does in fact occur, or

if words stressed according to the second language norms are just stored lexically, without the setting of parameters.

3.3.5 Studies of second language stress acquisition

As in first language acquisition, there has been little attention paid to the acquisition of lexical stress in non-primary languages. Exceptions to this include the Anani (1989) and Archibald (1990) studies mentioned above, as well as Mairs (1989), Baptista (1989) and Erdman (1973). The Anani (1989) study, however, discusses only transfer of first language constraints, and does not comment on the further development of second language stress.

In a study of native speakers of German, Erdman (1973) had them mark stress on English words that ended in suffixes with German equivalents. Though this study was not directly relevant to the study of metrical parameter setting, since it involved morphologically governed stress placement, the results were quite interesting. For several of the suffixes, the subjects tended to place main stress not on the final syllable of the suffix, as in German, nor on a syllable preceding it, as in English, but on the penultimate syllable of the suffix. Whether this placement would be made in their actual oral production is hard to say, but if we assume that it would, this is a case, like those discussed in Broselow and Finer (1991), of second language learners following a rule in between the first and second language norms.

Baptista (1989) conducted a study in which native speakers of Brazilian Portuguese, who were advanced students of English, read 128 target words contextualized in sentences. The words were chosen as exemplars of 16 rules adapted from SPE and Guierre's (1970) Drills in English Stress Patterns for the prediction of both unsuffixed and suffixed main stress. Six regular words and two exceptions for each rule were chosen. It is not clear why the subjects were tested on the exceptions, which appear to be analyzed along with the regular words, so that what is really being tested is the knowledge of the rules, and their exceptions. Baptista developed a hierarchy of difficulty for the rules, based on the percentage of errors, which she later rejects as "far from totally reliable, and of little use by itself" (Baptista 1989: 13). She notes that the problem of word familiarity is a contributing factor to the unreliability, since "varying the selection of words could have altered the order of difficulty" (Baptista 1989: 4).

She also tested six "strategies of prediction" for their power to predict the errors made by the students[9]. One of these strategies is the "predominant pattern of stress in English", which is identified, following Poldauf (1984: 23), as the "tendency to stress the third syllable from the end in a long word". She found that the pattern of errors is not biased specifically toward the third from the last syllable, nor to the penultimate syllable where Brazilian Portuguese

stress normally falls, but toward the initial syllable, regardless of the length of the word, even when the word is four or five syllables long. Baptista (1989: 8) concludes that "there is pressure of the predominant trisyllabic stress pattern, but this pattern seems to be frequently interpreted by the students as simply early-syllable stress, rather than the more specific antepenultimate stress." This could be interpreted, in a parameter setting framework, as the word level stress parameter having been set to [left]. Further evidence for this interpretation comes from a set of errors in words containing more than one stress. Baptista found that in 32 % of the cases when there was a subsidiary stress falling before the primary stress, main stress was given to the normatively subsidiarily stressed syllable. In the opposite situation, in which a subsidiary stress followed a main stress, main stress was misplaced only 17 % of the time.

These results are particularly interesting since Brazilian Portuguese, like English, has a [right] setting for word level stress. What might have happened is that the predominantly left edge stress in shorter English words has led the learners to set the parameter to a value found in neither language. Again, this is reminiscent of the findings of Broselow and Finer (1991), in which it seemed a setting intermediate between the first and second languages was adopted. Unlike that study however, the parameter setting adopted in this case is less correct for the target language

than was the original setting, if we assume that learners start off using their first language setting.

The two other studies of second language lexical stress assignment, Mairs (1989), and Archibald (1990), both present analyses in the framework of metrical phonology. Mairs (1989) elicited a set of 80 polysyllabic test words from 23 advanced native speakers of Spanish. Sixty-nine of the words were stressed very consistently across speakers. Of these 69, 24 were incorrectly stressed according to the target language norms. Mairs (1989: 263) assumes that "both correct and incorrect forms are generated by the same set of rules - the interlanguage grammar", and dismisses the fact that the incorrect forms could be generated by the native language grammar. As has been argued above, this is not a necessary assumption, given that the standard forms could be simply lexically stored, and not generated by rule, so that it is possible that the grammar possessed by the learners was still equivalent to that of their first language.

Her data, however, are quite interesting in that the errors follow a strong pattern, that seems to be phonologically, rather than lexically, based. The errors are almost exclusively on words that end in a vowel+glide+consonant cluster, with or without a following stress neutral affix. This type of cluster is extremely rare in the subjects' native language, being apparently only present in one word in Spanish. The subjects give main stress

to the syllables ending in this cluster, as in exercise and irritátes. In a quite complicated analysis, based on Hayes' (1981) account of English, Mairs claims that these words are stressed this way because they are marked as exceptions to extrametricality in the interlanguage grammar, which is argued to be otherwise identical to that of the target language.

It is assumed in Mairs' analysis that the interlanguage metrical grammar of these Spanish speakers of English is quite close to that of native speakers of English because they were able to consistently stress a good number of the words correctly. However, it should be pointed out that the words tested were quite common, and it is likely that they all could have been stored lexically, a possibility not considered by Mairs. In that case, all one would have to say about the set of errors is that because of the difficulty the learners had with the final clusters, they were unduly emphasized. In connection with this, Mairs neglects to point out that all the misstressed syllables are subsidiarily stressed in their target language forms, so that the error these subjects were making was only one of misplacing the word level stress, a common source of error in Baptista's study as well. Much more persuasive evidence of the possession of a native-like grammar would have been the demonstration of the subjects' ability to stress previously unencountered words.

Archibald (1990) is the only previous investigation of the first or second language learning of stress, of which I am

aware, that has adopted a parameter setting theory. In this study, subjects were asked to read a list of nouns and verbs with various penultimate and final syllable types, both in isolation and contextualized in sentences. Following that, they were asked to mark stress on the same words as they were read aloud by a native speaker. The subjects were native speakers of Polish, which differs from English only in the setting of the extrametricality and quantity sensitivity parameters, both being set negatively. It was found that most of the errors could be accounted for as a transferral of the first language settings. While Archibald does not make any claims about parameter resetting, he does make a claim for his methodology that seems quite unwarranted, when it is stated that "in this domain we seem to be able to infer parameter settings from perception results alone" (Archibald 1990: 12). If a subject had learned to recognize stressed syllables in a second language, would we want to say that was evidence for the resetting of parameters governing stress <u>assignment</u>? The recognition of stressed syllables is in all likelihood a prerequisite to parameter resetting, but should not be presumed to be identical to it. It is important to remember that in this sort of task, all of information needed to make a correct judgement of the placement of the stress is available in the data itself, in that there are acoustic cues that correlate with stress. That there is a first language influence in the perception task is interesting, but this can

perhaps be attributed to the fact that in completing this task, the subjects might repeat the words to themselves in an effort to determine the location of the stress. While Archibald makes a good case for the reliability of his instrument, its validity remains less certain[10].

3.4 Summary

While both the theory and the research concerning metrical parameter setting are at this time still not developed enough to support any firm conclusions, the evidence available does appear to be consistent with the existence of a stage in the learning of stress in which the stress patterns of words are stored lexically without the setting of the parameters. If we are to investigate the setting of the parameters, word familiarity must be controlled for. One method of doing this, that has been employed successfully in a number of studies of the existence of rules for stress, is by using nonce words. This methodology has unfortunately rarely been used in developmental studies, and not at all in the study of second language acquisition. In the following chapter, a pilot study of the acquisition of English metrical parameter settings by native speakers of French, that implements this experimental technique, will be presented.

Notes for chapter 3

1. Given another view of the mechanism by which heavy syllables receive stress, such as that expressed by Prince (1992) or by Halle and Vergnaud (1987), much of what is said here might have to be reconsidered, as pointed out by G. Piggott (p.c).

2. See White (1989) for experimental evidence that second language learners do not observe the subset principle.

3. Mellow (1988) comes to a remarkably similar conclusion in a syntactic learnability study of Cree as a first language. He argues that to set certain syntactic parameters properly, learners of Cree must make comparisons across cases, since on the basis of individual bits of evidence they might otherwise adopt an improper setting. He goes on to claim that weight of evidence must be gained to set syntactic parameters.

4. That both settings of a parameter require positive evidence is possibly the case within an incremental model as well. D&K (p.174) discuss the problem of cross-parameter dependencies, in which the setting of one parameter (e.g. P1) is dependent on the setting of a previous parameter (P2). If P1 is set on the basis of the unmarked setting of P2, before positive evidence occurs for P2, things can go "spectacularly wrong". D&K conclude that it is necessary to distinguish between an unmarked parameter setting, and the same setting for which evidence has been obtained and so is "frozen". It is only the frozen unmarked setting which could be relied on by the dependent parameter.

5. Most generative linguists would probably argue that the type of theoretical investigation I am describing here is in fact empirical, since it is based on facts about languages. However, there does seem to be another kind of empirical linguistic research, in which one frames hypotheses, that lead to predictions, and tests these predictions against the behaviour of users of language. It would be quite difficult to derive conflicting behaviourial predictions from the hypotheses that the QS parameter is set on the basis of a cue a) within a word or b) across words.

6. See 3.3.3 for discussion of whether it is actually this parameter that would be set.

7. There are some cases in which a known word might not have been heard. One example would be a word that had been read but not heard. It is to be noted that such words are not uncommonly mispronounced, but that there are significant

regularities in the pronunciation of unknown words, a fact that supports the existence of parameters, as is discussed later in this chapter.

8. An early setting of the parameters does not entail an early mastery of the entire stress system, but only its core. Interestingly, Jane Fee (personal communication) reports overgeneralizations of morphologically based stress patterns in her eight year old son's speech. And of course, exceptional forms would have to be learned as they are encountered.

9. Adjemian (1976) argues convincingly that non-native speaker speech should be analyzed only as a product of linguistic rules, rather than strategies, since this latter mode of analysis implies an a priori difference between the nature of first and second language speech.

10. In Archibald (1991: 101), he states that "... we should not infer actual parameter settings from perception data alone". Also, it is claimed that his study offers evidence that "[a]dult L2 learners do seem to be able to reset their parameters when learning a second language" (p.234). I obtained a copy of this paper, his dissertation, only after having submitted the initial draft of this thesis, and so have not had the time to evaluate its claims and to incorporate it into the present review of the second language literature.

4. The study

4.1 Research questions

If we assume that the starting po it for the learning of English by native speakers of French is the use of the French parameter settings[1], and that learning proceeds by the resetting of the parameters, then several of the parameters for stress assignment will have to be reset if the learner's underlying system is to resemble that of a native speaker's. The purpose of the present study is to undertake an initial investigation of this resetting. No specific hypotheses and predictions are being tested, as there has been too little previous research done to generate such hypotheses. In fact, the main goal of this study is to provide a methodological framework and some tentative answers to basic questions so as to facilitate the generation of hypotheses for future research. As mentioned in the previous chapter, there is some controversy over whether adult learners of a second language have access to Universal Grammar, and are able to reset parameters, or if they have access only to the first language settings, and must rely entirely on other cognitive strategies for language learning. The first question to be addressed, then, is whether the metrical parameters are in fact reset by second language learners. If evidence is found for resetting, then we can look at the order in which the parameters might be reset.

4.2 Parameters to be investigated

Stress in French is quite different from stress in English, so a French learner of English as a second language has to go a long way to develop a native-like system for stress placement. Stress placement in French is completely regular, with stress falling on the rightmost syllable of words. The parameters of French stress are given in (1), alongside those for English.

(1)

Parameter	French	English
P1: Feet are [Binary/Unbounded]	Unbounded	Binary
P2: Feet are built from the [Right/Left]	N/A	Right
P3: Feet are strong on the [Right/Left]	Right	Left
P4: Heavy syllable projection [Yes/No] (Quantity Sensitivity)	No	Yes
P5: Word level prominence is [Right/Left]	Right	Right
P6: Extrametrical syllable [Yes/No]	No	Yes
P7: It is extrametrical on the [Right/Left]	N/A	Right
P8: Feet are noniterative [Yes/No]	N/A	No

In French, feet are built as large as possible, up to the limit of the word, which means they are unbounded (P1), in contrast with the maximally binary (bisyllabic) feet of English. As Halle & Vergnaud (1987: 11) note, for languages with unbounded feet, the direction of foot construction (P2) is irrelevant, as the results will always be the same regardless of the direction. In a binary language like

English, however, different directions of foot construction will produce different parsings of a given syllable string. For example, a three syllable string with binary feet will be grouped as $(\sigma\ \sigma)(\sigma)$ when constructed from the left, and as $(\sigma)(\sigma\ \sigma)$ from the right. French feet are strong on the right, and English strong on the left (P3), producing iambic and trochaic feet respectively. Syllable weight plays no role in French, so the Quantity Sensitivity parameter (P4) is set negatively. In a sense, the setting of the word level prominence parameter (P5) is also irrelevant, since if there is one and only one head of a foot, the higher level marking, be it left or right, will produce the same result. That stress is always at the right side of the word, however, would be a strong cue for a [right] setting. There is no extrametrical syllable (P5 & P7), as stress is at the right edge. For a language in which the foot and the word are coextensive, as in French, iterativity (P8) is not applicable.

In (2), metrical grids for the English <u>monosyllable</u> and French <u>monosyllabe</u> are built, to illustrate the operation of the parameters.

(2)

```
                                                    *
                          *     *               (*    *)
      * * *  *<.>       (* *)(* *)<.>        (* *)(* *)<.>
-1->monosyllable -2-> mono syllable -3-> mono syllable

                                                    *
                                 *                 (*)
      * * * *           (* * *  *)         (* * *  *)
-1->monosyllabe  -2-> monosyllabe -3-> monosyllabe
```

In the first stage, the rightmost syllable is marked as extrametrical in English, but not in French. In the second stage, binary left-headed feet are constructed in English, and an unbounded right headed one in French. In stage 3, the rightmost head of a foot is marked as the head of the word, in both languages (see chapter 2 for details on the parameter choices and grid construction process in English).

4.3 Methodology

4.3.1 Testing procedure

As the pronunciation of previously unknown words has been taken to be evidence for the operation of first language metrical parameters (see 3.3.3), the same phenomenon should be of interest in determining whether learners of a second language are using parameter settings different from those of the first language. Given the possibility of lexical storage of previously heard words, the target-like pronunciation of real words is not a very good source of evidence for parameter resetting, though mispronunciations could reveal the existence of non-target-like settings, transferred from the first language, as in Archibald (1990), and Anani (1989), or mistakenly adopted for the second language as in Baptista (1989) (see 3.3.5).

It was thus decided to use nonce words in this study. Since the Quantity Sensitivity parameter (P4) is set differently in English and in French, words were created with

a variety of syllable weight combinations, to see if syllable weight had any effect on stress placement. The heavy syllables used, especially in the crucial medial syllables, are almost exclusively of the form CVC. In a pilot study[2], it was found that native speakers were quite inconsistent in their pronunciations of words with penultimate CVV syllables, perhaps due to their having optionally shortened such long vowels. To see effects of the parameter for foot size (P1), only words larger than two syllables were used. Words were not created any longer than four syllables, though, since they would probably present articulatory difficulties. The sixteen test words, and the weights of their syllables[3], are given in (3).

(3)

ga.di.ma (L.L.L)	pa.ri.da.mee (L.L.L.H)
ta.di.net (L.L.H)	ka.ta.pes.tos (L.L.H.H)
ki.ta.mat (L.L.H)	na.cos.tra.can (L.H.L.H)
tu.gum.ster (L.H.L)	pa.gan.dek.ta (L.H.H.L)
ka.dow.tet (L.H.H)	kan.den.ta.la (H.H.L.L)
a.klip.ter (L.H.L)	man.da.dek.stra (H.L.H.L)
toe.bi.da (H.L.L)	a.pen.tok.sis (L.H.H.H)
poe.dek.tal (H.H.H)	ka.pis.trat.son (L.H.H.H)

The words were presented to the subjects both in isolation, and contextualized in sentences. To abstract away from morphological factors, the words were all contextualized as nouns. They were all placed in subject initial position of the sentences to prevent the intonation effects found at the end of the sentence from distorting the stress patterns of the words. A simplified spelling system was used in an attempt to

control the variability of the subjects' interpretations of the words. This system was presented in a short training session prior to the test. The spelling system and the contextualized words are presented in the Appendix.

In the task itself, the subjects were asked to read each word syllable by syllable, and then to combine the syllables to make a word. They were then to repeat the word to themselves, until it felt natural, at which point they were to read the word, and the sentence containing the word, into the tape. They were also asked to speak at a normal conversational speed (since overly careful pronunciations would result in evenly stressed syllables). They were told that what was being studied was their pronunciations of new words, without mentioning stress. Thus, the subjects could perhaps be described as semi-blind to the purpose of the study[1].

4.3.2 Subjects

The question of the order of resetting would be best investigated in a longitudinal study. However, given the sustained involvement such a study requires, on the part of both the researcher and the subjects, it was decided to use a cross-sectional design, in hopes of gaining at least some insight into the issue. In this methodology, a fairly homogenous group of subjects, at varying levels of proficiency, is tested. The results from the subjects at the various levels are then compared, to see if a developmental

pattern emerges. In this case all 57 subjects were native French speakers from Quebec, none of whom reported speaking a third language. They were tested in the first week of a summer immersion programme in Ontario.

The following information was garnered from a background questionnaire administered prior to the test. The average age of the participants was 20.07 (SD 3.75) at the time of the test. All the subjects but two started learning English in school. The average age for starting to learn English was 11.8 (SD 4.53). These distributions are somewhat skewed by the presence of two subjects who started to learn English in their thirties. Extracting their ages from the data, the average ages become 19.46 (SD 2.04) at the time of testing, and 10.98 (SD 1.71) at the start of learning English.

To get an idea of the type of exposure these learners had to English as they were learning it, they were asked to estimate the number of hours they spent speaking English outside of the classroom, watching English television, and listening to English music, both during the first five years of learning the language, and at home in Quebec at the time of the test.

During the earlier period, of the 57 subjects, 53 reported speaking no English outside of the classroom. 36 watched no English television, and the group mean was 2.02 (SD 4.55) hours per week. However, all but three reported listening to English music, with a group mean of 7.51 (SD

10.46) hours per week.

At the time of the test, 44 still spoke no English outside of the classroom. English television viewing had increased to an average of 2.63 (SD 3.6) hours per week, and English music listening to 9.24 (SD 11.85) hours per week. It can be concluded, then, that the primary source of language input was the classroom, although there was some exposure to English in other situations.

Fifteen native speakers were tested as a comparison group. They were all of university age. Eight of these subjects were undergraduate students of Teaching English as a Second Language, while the rest had no training in either linguistics or second language teaching.

4.3.3 Rating procedure

The rating of production data for stress placement is somewhat problematic in developmental studies. Pollock, Brammer and Hageman (1989: 141) criticize the use of perceptual transcriptions in Klein (1984) and Hochberg (1988a). They cite Brammer's (1988) study as finding that interrater reliability for stress transcription averages 69% for two year old subjects, 74% for three year olds, and 81% for four year olds. They explain these relatively low figures as resulting from a lack of control in the children's use of the acoustic features for stress, "providing the listener with inconsistent or unreliable cues".

In all likelihood, second language learners have a similar lack of control of the intensity, fundamental frequency, and duration of stressed syllables. Also, vowel reduction seems to appear much later in English as a second language than does stress (Flege & Bohn 1989). The presence of reduced vowels greatly facilitates the identification of stressed syllables in the speech of native speakers of English, and their lack seems to hinder raters of non-native speech. None of the previous second language studies report on interrater reliability, suggesting that the rating was done by the investigators themselves, a potential cause for concern. In a pilot study for this project, presented as Pater (1991), the validity of the reported results was severely constrained by an interrater agreement of only 74.7% on words in which stress was marked by both raters.

The best way to overcome these problems in reliability would seem to be through the use of an instrumental rating procedure, as done by Pollock, Brammer and Hageman (1989). Unfortunately, the equipment for such a undertaking was unavailable for this study. Therefore, several measures were taken to enhance the performance of the raters. A training session was held, in which a sample of three subjects, taken from an earlier pilot study, was rated independently by each judge, and then listened to again and discussed by the raters and myself. The raters reported this as having been helpful. The subjects were separated onto three 45 minute tapes, and

the raters were asked to listen to only one of them each day, so as to prevent fatigue. The order of presentation of the subjects on the tapes was varied between the raters. They were asked to spend two hours on each tape, to allow time for them to check their ratings. A 'dummy' subject, also taken from a previous pilot study, was placed at the beginning of each tape, to give the raters a chance to warm-up.

The two raters chosen for this study were graduate students in the School of Human Communication Disorders at McGill University. These students were considered well suited for this task because the training in phonetics that is a component of their program would have given them the requisite practice in listening to speech objectively. Also, they would probably have fewer expectations of where the stress placement in French learners' speech might be, than would students of either applied or theoretical linguistics.

The raters were asked to indicate any syllable that seemed to be stressed, and if there were more than one stressed syllable, to indicate the most prominent of them. They also had the option of marking a word as evenly stressed when no syllable seemed prominent. All previous developmental studies, including Pater (1991), have focussed only on the placement of main stress. Several factors, however, have led to this study's inclusion of subsidiary stress. The theoretical frameworks presented by Hayes (1982) and Halle and Vergnaud (1987) assume that in English, main stress placement

precedes subsidiary stress application. However, as was argued in sections 2.3.3.1 and 2.3.3.2, this is by no means a necessary assumption, and in fact, a much less complicated analysis of English can be arrived at if one assumes the reverse is the case. As well, the parameter responsible for the placement of subsidiary stress, P1 above, is involved in the placement of primary stress, even in the analyses of Hayes and of Halle and Vergnaud. Furthermore, Archibald (1990), Baptista (1989) and Mairs (1989) all present data that suggests the misplacement of main stress onto a normatively subsidiarily stressed syllable is a common phenomenon in English as a second language, regardless of the native language background. And perhaps most importantly, having the raters mark only main stress is a potential aggravator of problems in interrater reliability. Both raters might perceive a word as having two stressed syllables, but have difficulty in choosing between them, and each mark a different syllable as primarily stressed. If subsidiary stress were not indicated, the results would only show the raters' disagreement about the relative prominence of the two syllables, and not their consensus that the two syllables had been stressed.

4.4 Results and discussion

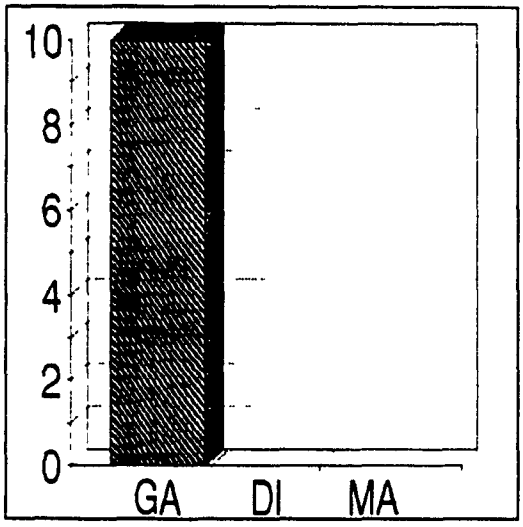
4.4.1 Native speakers

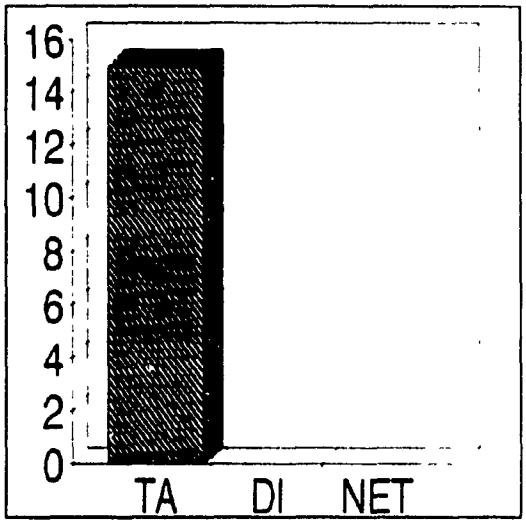
There appeared to be no significant difference between the subjects that were studying TESL and those that were not.

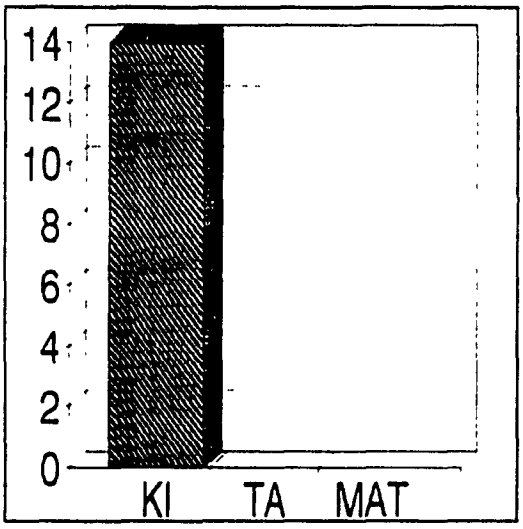
The results are shown in the graphs in (4). Pronunciations in which vowel quality or the number of segments was altered have been omitted from the tabulations. The Y-axes show the number of tokens in which a given syllable was stressed. The bars with heavy shading indicate primary stress, with subsidiary stress being indicated by the lightly filled bars.

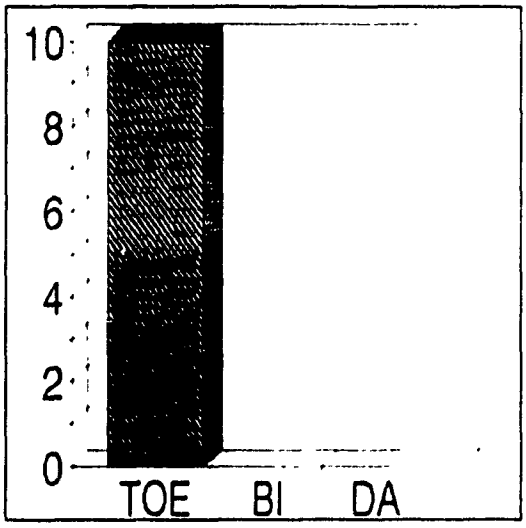
(4) Native speaker results

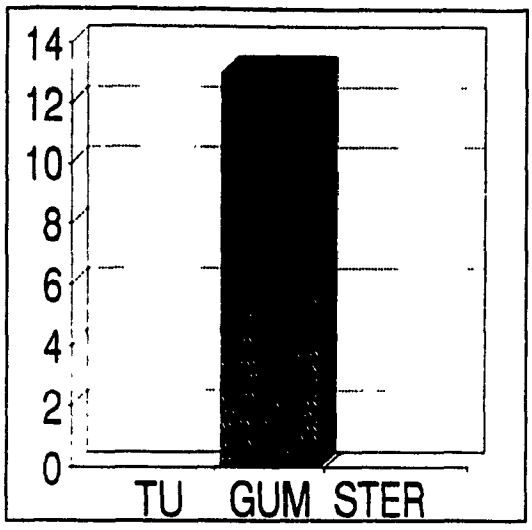
(a) Three syllable words







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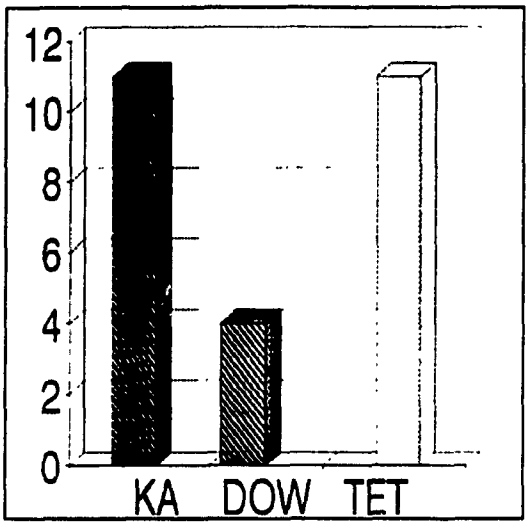
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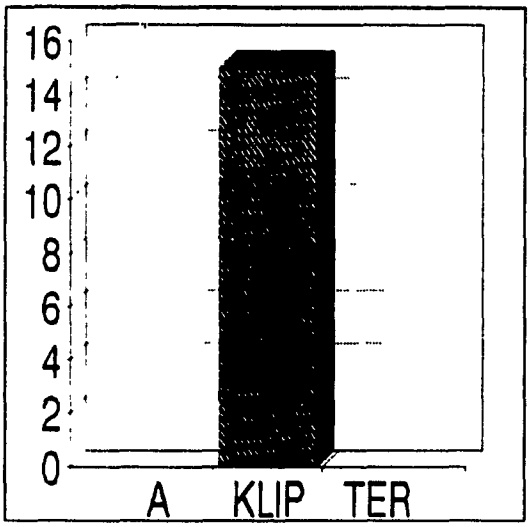
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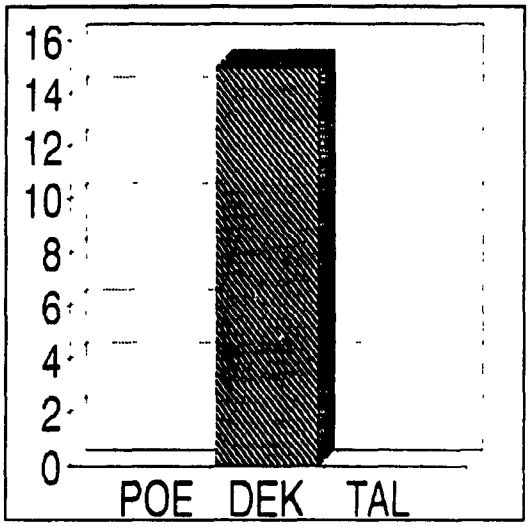
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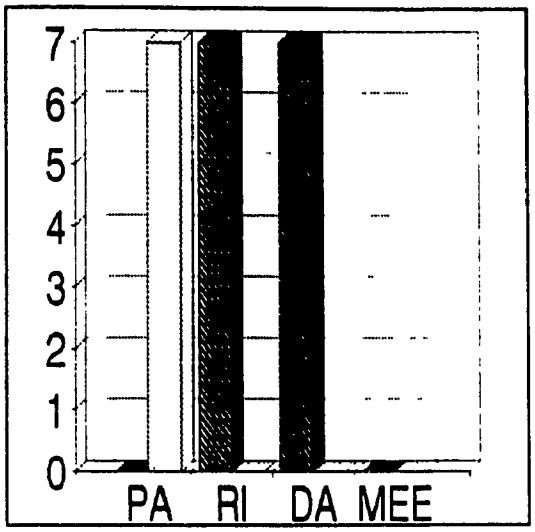
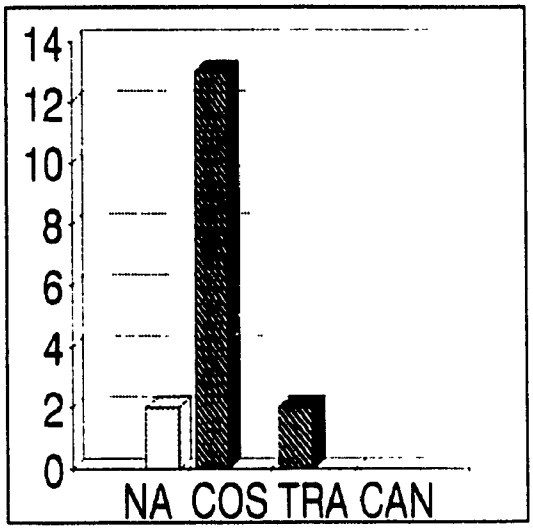
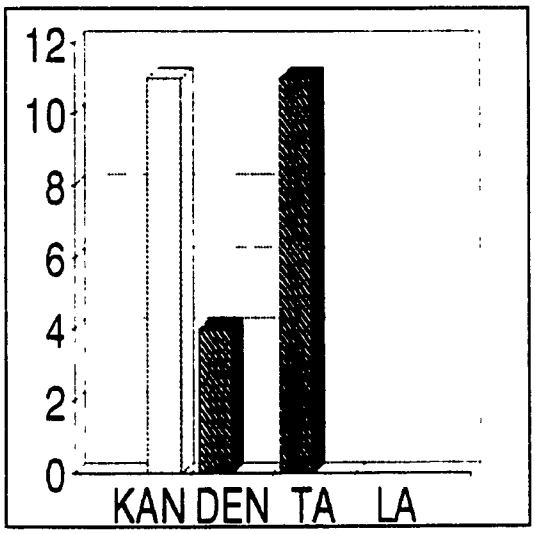
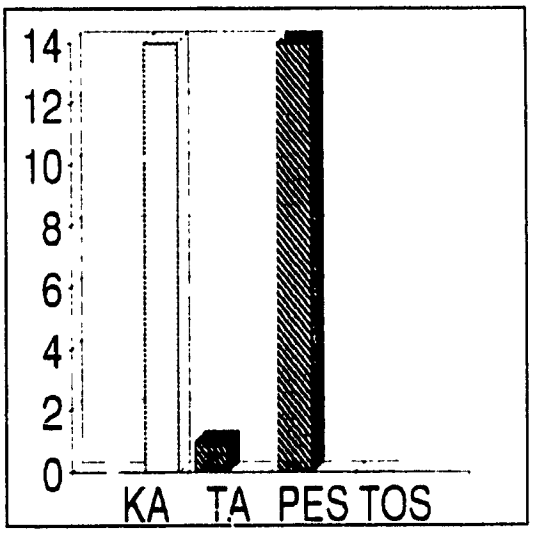
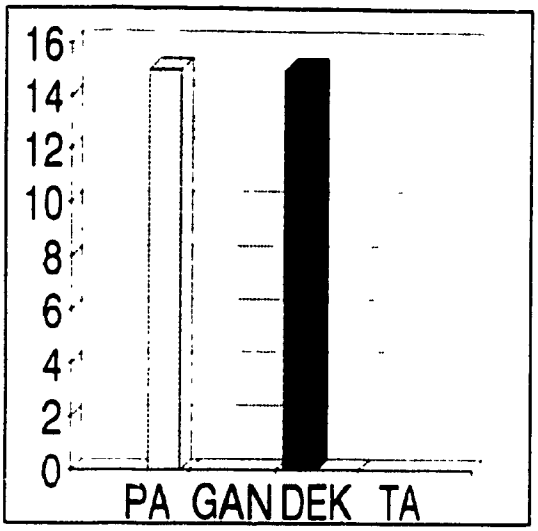
(b) Four syllable words

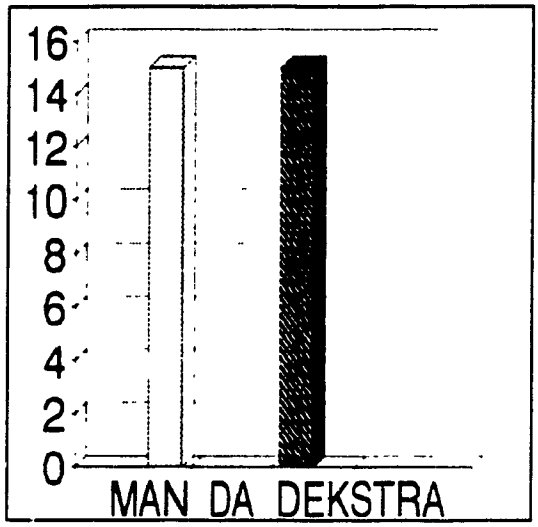


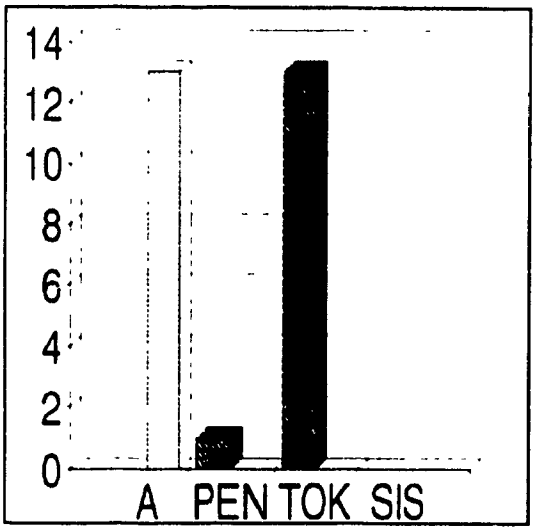


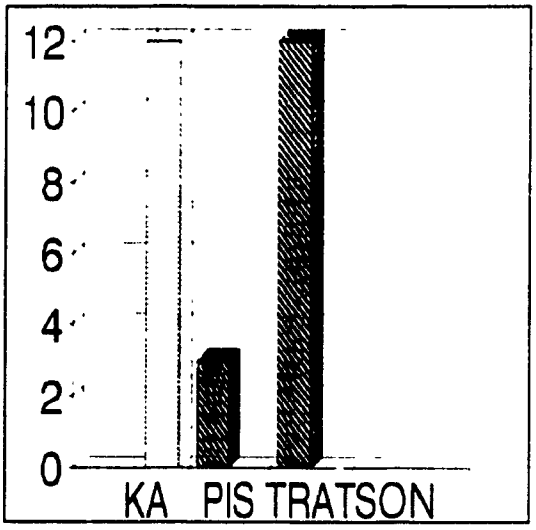












For the most part, these pronunciations follow the predictions of the parameter settings. The rightmost syllable generally receives no stress, due to extrametricality. When heavy (i.e. CVC or CVV, where VV is a long vowel or diphthong), the penultimate syllable was usually primarily stressed, and when the penult was light (i.e. CV, where V is a short vowel), the antepenult generally received main stress (see 2.3.3 for an explanation of how these patterns are

produced by the parameters). Of the three syllable words above, the first four have light penults, and the second four have heavy ones. The only deviation from the predicted pattern of stresses occurred in the case of kadowtet, which was most often produced with final subsidiary stress and initial primary stress. A likely explanation for this is that the -tet ending is often classified as a consistent exception to extrametricality and as finally stressed. All of the words contained in the WordPerfect 5.1 dictionary that end in -tet have stress on the final syllable (e.g. quintet, octet, septet). The Rhythm Rule, which applies only to words with final stress, would then move the primary stress to the first syllable (see Halle & Vergnaud 1987: 234), leaving only the subsidiary stress on the final syllable. The real -tet words listed above are exceptions to this rule. Regardless of how this exceptional stress pattern is explained, it would seem advisable to avoid the use of the -tet ending in future studies of this kind.

The mispronunciations of three syllable words, that have been omitted from the above graphs, always involved the tensing and lengthening of a vowel, thus creating a heavy syllable. This occurred five times in the medial syllables of each of gadima and toebida, twice in the initial syllable of tugumster, and once in the initial syllable of kitamat. The medial syllables, being in the penultimate position, attracted primary stress in every case. The other mispronunciations did

not seem to affect the stress patterns of the words[5].

While following the same general pattern of main stress placement, the four syllable words were subject to more variation in their pronunciations than the three syllable ones. Secondary stress, however, was entirely predictable, falling two syllables to the left of the primarily stressed syllable. The largest source of deviation from the predicted patterns of primary stress were the words with penultimate short syllables (kandentala, paridamee, and to a lesser extent, nacostracan), which were quite often pronounced with penultimate primary stress. There is a fairly large class of real words in English that follow this pattern. Some examples of words with a stressed penultimate /æ/ without an apparent closing consonant, as in the test words, include impala, debacle, nirvana, banana, and digitalis. There has been some discussion in the literature about how best to deal with these cases. Selkirk (1984) proposes that they should be treated as lexically marked exceptions to extrametricality, while Halle and Vergnaud (1987) propose that they are stored lexically with a line 1 asterisk. The problem with these explanations is that they treat the words as being exceptional. If they were exceptionally marked in the lexicon, one might wonder why nonsense words are so frequently pronounced in this way. In Baptista (1984) this class of words, with a variety of lax vowels, was produced with antepenultimate stress only 58% of the time. Another possible explanation, and one that seems

intuitively plausible, is that the consonant following the penultimate vowel can be optionally syllabified as the coda of the penultimate syllable, prior to stress placement. This explanation, however, flies in the face of the apparently universal theoretical assumptions that a) syllabification follows an onset principle (e.g. Ito 1988), which implies that consonants between two vowels are syllabified as onsets, and b) that syllabification is entirely predictable. Thus, these pronunciations do not seem to be theoretically explicable at this time.

It is worth noting that in two of the three instances of kapistratson being produced with antepenultimate stress, the speakers seemed to have a lot of difficulty producing the form, one of them making six false starts before managing to get the whole word out. Impressionistically, these forms, as well as the antepenultimately stressed versions of katapestos and apentoksis, seem far less natural than do the unpredicted forms discussed in the preceding paragraphs, as is suggested by their less frequent appearance. It seems that this variation, at least, can safely be swept under the carpet of performance, and does not require an explanation in terms of the native speakers' competence.

4.4.2 Subject responses

The inclusion of ratings for subsidiary stress does entail some complications in the calculation of scores for interrater reliability and for the tabulation of the results. If the interrater reliability figures were calculated on the basis of absolute agreement between the raters' judgements of the stress patterns of the words, the percentage of agreement would be very low, and would conceal a great deal of actual consensus between the ratings. For example, the raters might agree on the placement of main stress, but disagree on the placement of subsidiary stress. In fact, this was an extremely common occurrence. Where both raters marked subsidiary stress, the interrater agreement was only 53.14%. This falls to 36.74% when the cases in which only one rater marked subsidiary stress are included. These figures are improved to 66.8% and 42% when the cases discussed in 4.3.3, in which the raters marked the same two syllables as stressed but differed in their judgment of the relative prominence of the two, are taken out. As hypothesized, this phenomenon was also responsible for a great deal of the lack of agreement about the placement of main stress. Overall, main stress agreement was a somewhat disappointing 74.43% when both raters marked main stress, wh ch is a few tenths of a percentage point lower than the pilot study. However, this rises to 81.07% when the aforementioned cases are discarded.

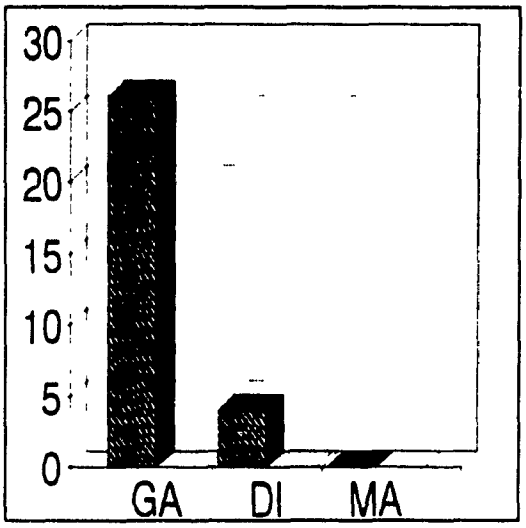
In order to bolster the validity of the results presented

here, it was decided to include only ratings in which there was an agreement that the syllable had been stressed. In cases where both raters marked a syllable as primarily or subsidiarily stressed, a score of 2 was given to that syllable under the category of either primary or subsidiary stress. When they disagreed about whether the syllable was primarily or subsidiarily stressed, a score of 1 was given to the syllable under both categories. Not included in the analyses were words that either rater marked as evenly stressed, or that underwent changes in vowel quality that might correspond to syllable weight changes, or that differed from the target form in segmental shape.

4.4.2.1 Overall results

In (5), graphs are presented for all the subjects as one group. The Y-axes show the scores for syllables calculated as described above. Again, the heavily shaded bars indicate scores for primary stress, with the lightly shaded ones indicating subsidiary stress.

(5)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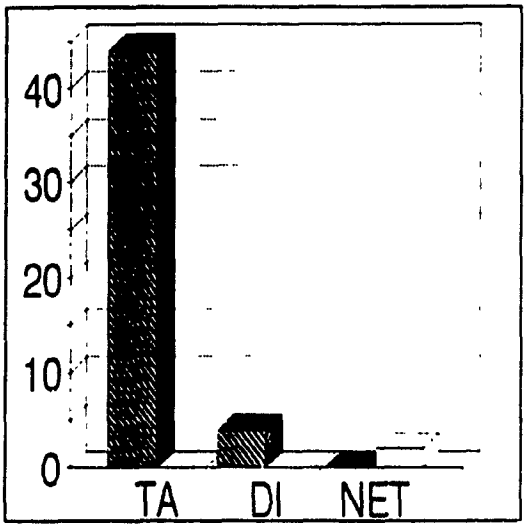
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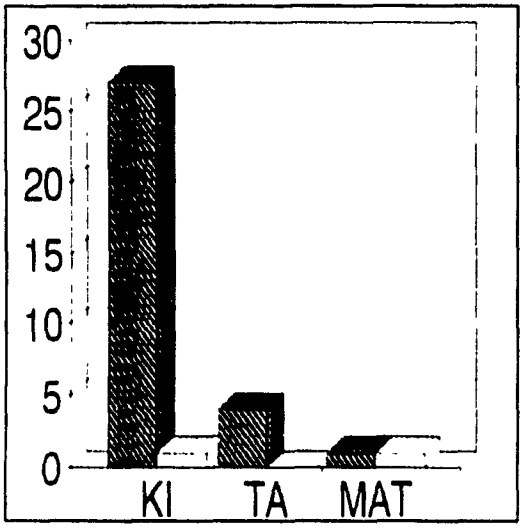
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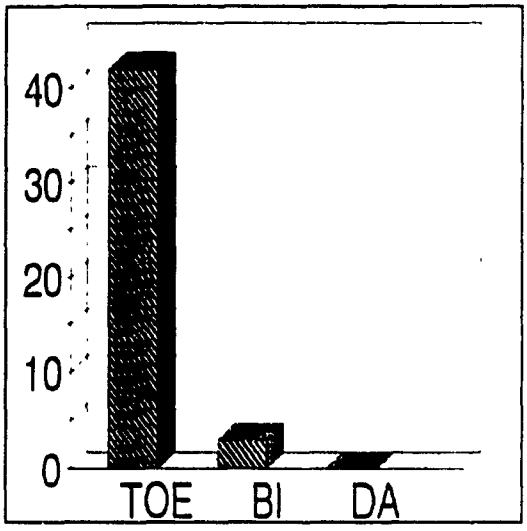
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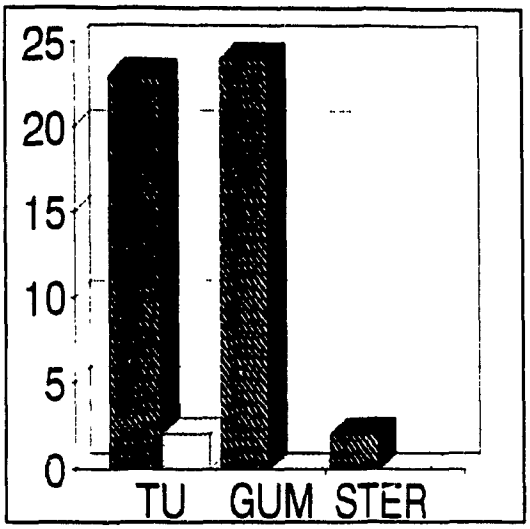
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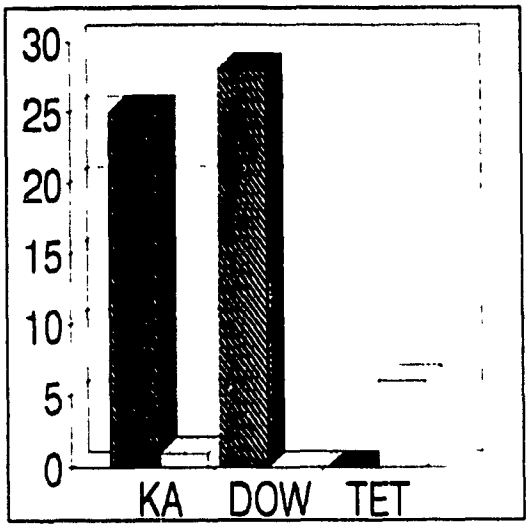
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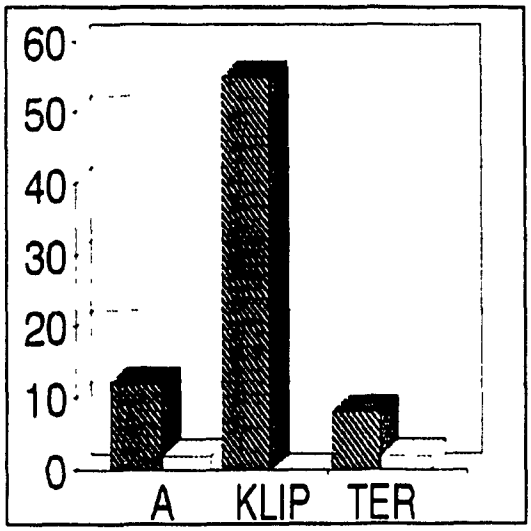
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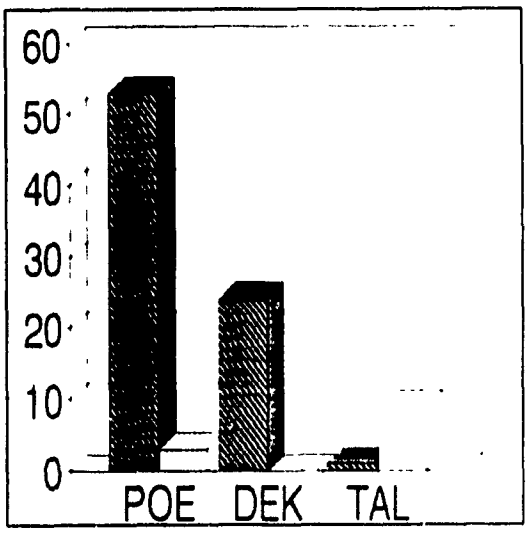
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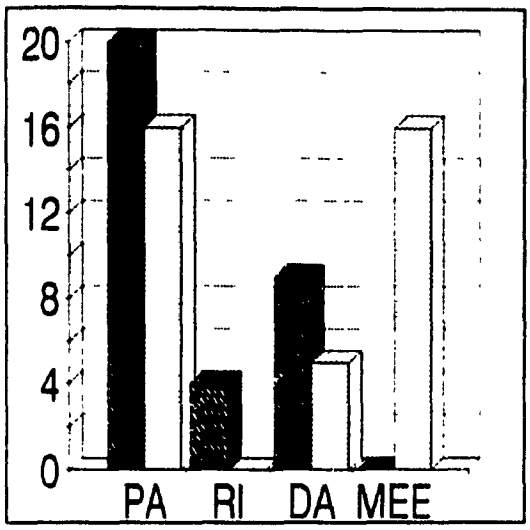
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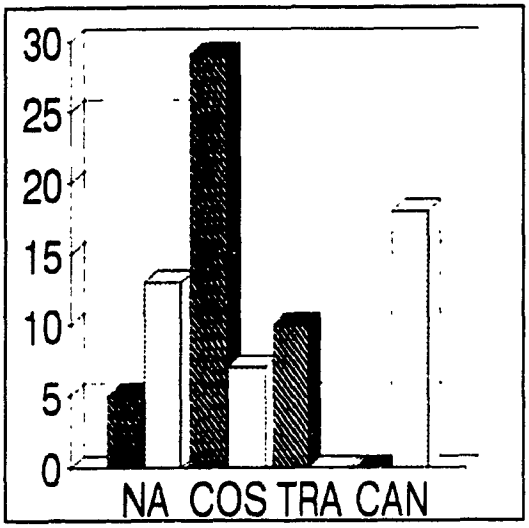
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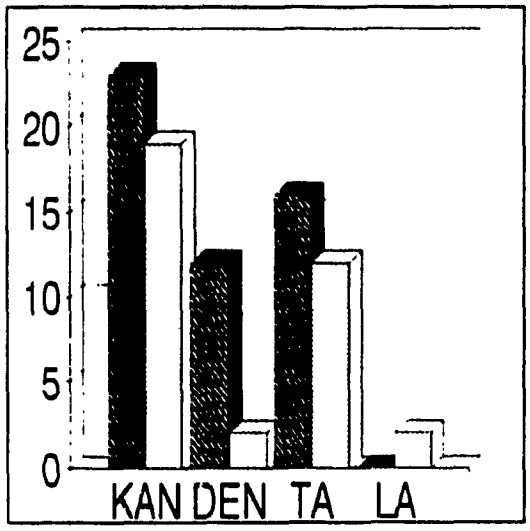
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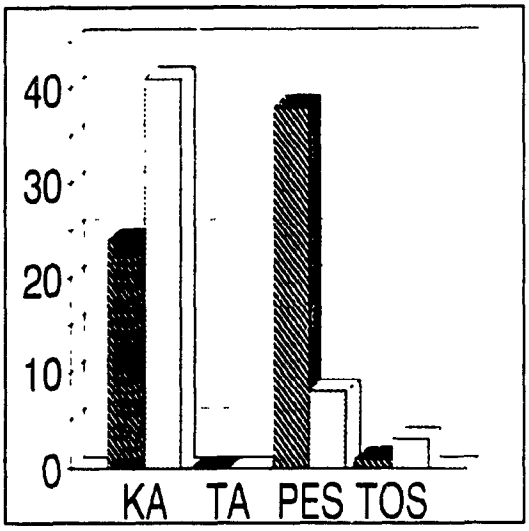
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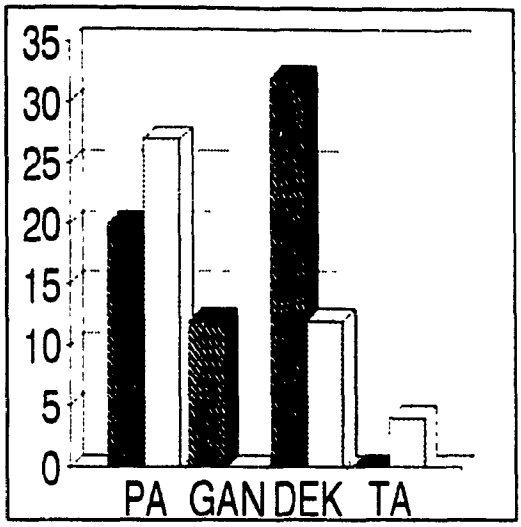
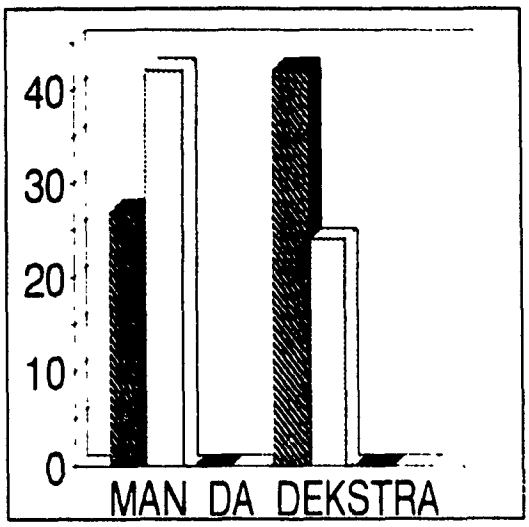
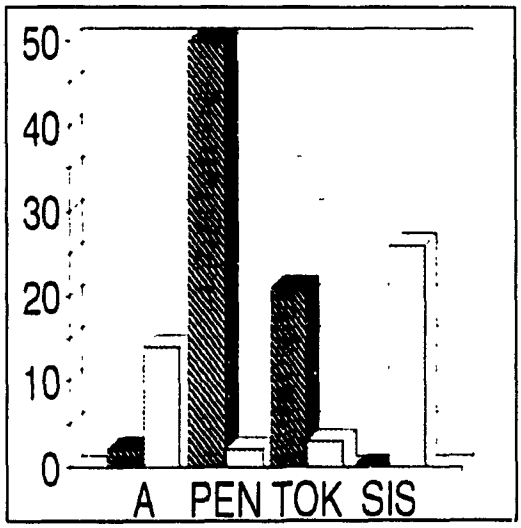
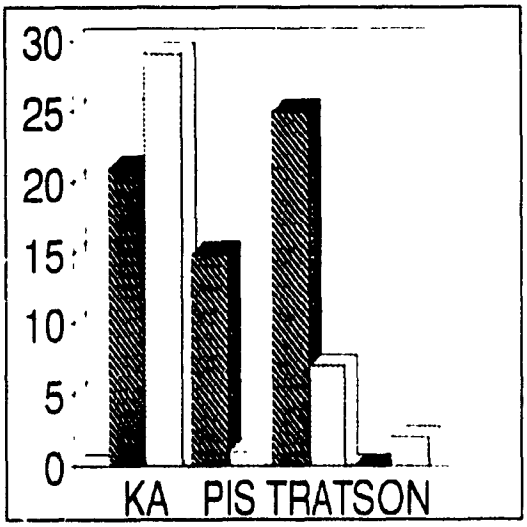








Immediately apparent in these graphs is the nearly complete lack of stress placement based on the French parameter settings[6], as well as the fact that the placement of stress does not follow the same pattern as that of the English control subjects. Clearly, these learners know, at some level of cognizance, that the stress pattern of English is different from the stress pattern of French, but do not possess the same

knowledge of English stress as do native speakers. In what follows, an attempt will be made to describe these learners' generalizations about English stress in terms of metrical parameter settings.

The most consistent result in the learner data occurs in the case of the three syllable words that have light syllables in the medial position-gadima, tadinet, kitamat, and toebida. All of these are almost always stressed initially, as in the native speaker results. In terms of the parameters, this must signify a resetting of the parameter for headedness of feet (P2) from the French setting of [right] to the English setting of [left]. The only other possibility is that the analysis of French given above is incorrect, and that feet are not constructed at all, stress being generated only by the word level prominence parameter P5. These results would then be explained as a resetting of that parameter. This latter explanation is contradicted, however, by the overwhelming tendency toward subsidiary stress shown in the four syllable words. In all of those words, two syllables away from each main stress column there is usually a subsidiary stress column of approximately the same height. This is most transparently shown in the chart for mandadekstra. Since the word level parameter could only produce one stress, it seems safe to assume that feet are being constructed, and that these feet are left-headed. Also, the parameter specifying noniterativity of foot construction (P8) must be set to [no], in order to

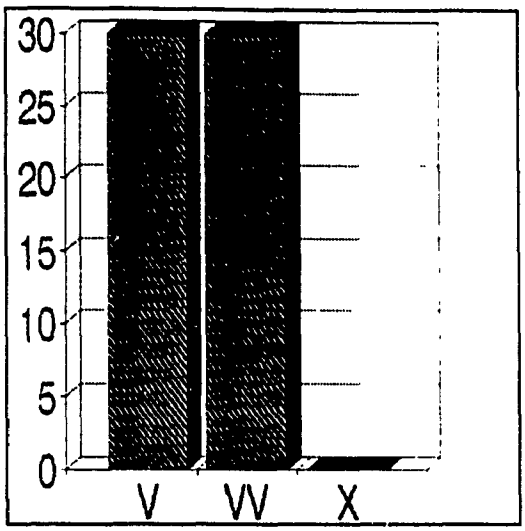
generate more than one stress. It is most likely that P1, specifying the size of feet, has been reset to [binary], since there is an alternating pattern of stresses in the four syllable words. This is not clearly reflected in the graphs, since adjacent syllables are shown as being stressed in all the four syllable words but mandadekstra. However, such adjacent stresses were never produced by any of the subjects. What is being shown in the graphs is, for example, that some subjects produced kándentàla, while others said kàndentala or kandéntala, rather than some of the subjects having said kàndéntàla. The possibility of unbounded feet having produced these multiple stresses cannot be entirely dismissed until after the discussion of extrametricality (P6) and quantity sensitivity (P4), as will be explained below.

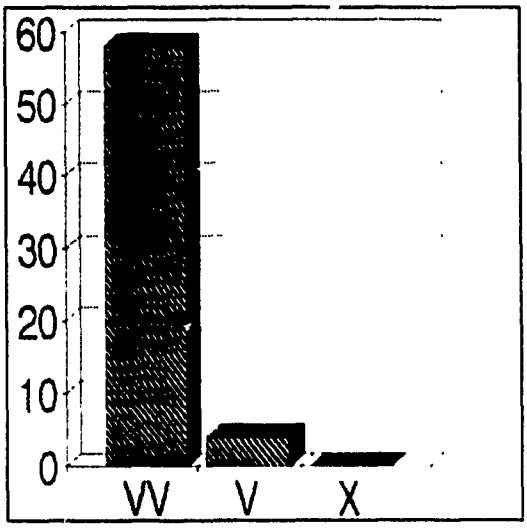
There is a marked difference between the three syllable words with light medial syllables discussed above and the others that all have heavy medials, with the heavy medials attracting stress most of the time. Similar differences can be observed in the four syllable words, when one compares mandadekstra, katapestos, and paridamee, all having light second syllables that are very rarely stressed, with the other words that have heavy second syllables that are often stressed. That the distinction is not as sharp as in the native speaker results is only to be expected in a developmental study. The difference between these two groups of words can be explained by the resetting of the quantity

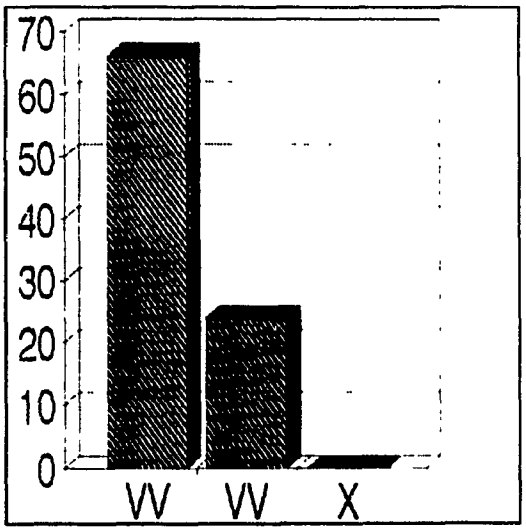
sensitivity parameter to English value of [yes], by some, but not all of the subjects.

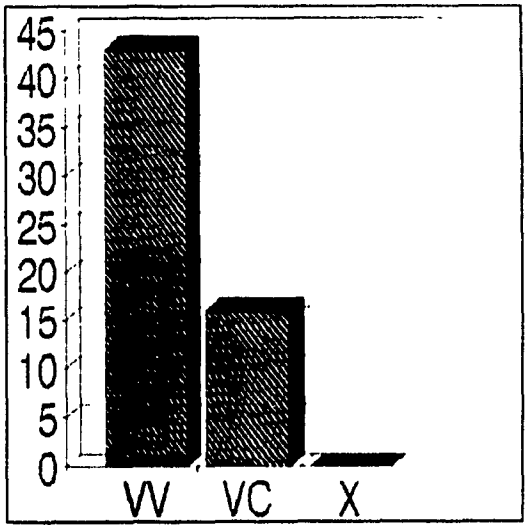
There is an intriguing dissimilarity between the interlanguage and the native language results that can be observed at this point. Poedektal is most often produced with main stress on the initial syllable, in contrast with the other words with heavy medials, and with the native speaker results. The difference between this word and the others is that poedektal has an initial tense vowel. While there is only one test word with this syllabic composition, there is a set of mispronunciations that resulted in similarly shaped words, that were left out of the original tabulations. As in the native speaker results, the most common deviation from the target forms was in the tensing of vowels that were supposed to be lax. For example, tugumster was often pronounced with a tense initial /u/, kitamat with a tense initial /i/, toebida with a tense medial /i/, and so on. There is too much variation between the mispronunciations to look at them word by word. Instead, they have been grouped according to the composition of the syllables, and scores have been calculated according to the system outlined above. In the graphs in (6), VV signifies an open syllable with a tense vowel, V an open syllable with a light vowel, VC a syllable with closing consonant, and X any syllable. There was no interrater agreement on subsidiary stress placement.

(6) Mispronunciations









The pattern observed in the pronunciations for the individual words is replicated in these classes of mispronunciations, which gives support to the account developed thus far on the basis of those words. The V VV X words have an pattern of stresses almost identical to <u>kadowtet</u>. The VV V X words are stressed like <u>toebida</u>. The stresses on the VV VC X words pattern just like <u>poedektal</u>, as do those of the form VV VV X.

Unlike English there is not a direct link between vowel quality and vowel quantity in the native language of the subjects. In English it can be inferred from the tenseness of an /i/ that it also long. In French however, both short and long /i/ exist, in different environments (Picard 1987). To be treating the initial syllable of poedektal, and of the mispronounced VV VC X and VV VV X words as heavy, the subjects would have had to learn that these vowels are long in English.

In native speaker English, there is no difference between the main stress placement in poedektal and tugumster because of the direction of foot construction (P2), and the [right] setting for word level stress (P5). Stress is assigned from the right, so it is only the first heavy syllable encountered after the extrametrical rightmost syllable that affects the placement of the rightmost stress. If the initial syllable is heavy, it retains the stress assigned in heavy syllable projection, and is not reduced (e.g. vocation and poedektal). If the initial syllable is light, it is not assigned stress, due perhaps to a clash filter (see 2.3.3.2), and is reduced (e.g. vacation and aklipter). The rightmost stress becomes the main stress after the application of word stress (P5).

For the initial syllable of poedektal to be assigned main stress with quantity sensitivity set positively, there are at least two possible explanations. Following the approach (but not the exact terminology) laid out in Halle and Vergnaud (1987), the only possibility is that the word stress parameter

has been reset to [left]. The derivation would proceed by first assigning prominence to the first two syllables because of Heavy Syllable Projection. Extrametricality would need to be set positively to account for the lack of stress on the last syllable. Both of the syllables would form monosyllabic feet, with greater prominence being given to the initial syllable at the word level. The stress on dek would be removed either by stress conflation, or by a destressing parameter (Dresher & Kaye 1990) that removes the stress from the less prominent of two adjacent syllables. The former method of stress removal would then have to posit a later separate process of secondary stress assignment (see 2.3.3.1 for an explication and critique), while to assume destressing would be to invoke a parameter inoperative in either French or English.

In the spirit of the analysis of English stress assumed in the present work, the explanation for the interlanguage forms would involve a constraint specifying that only binary feet are permitted, while monosyllabic feet are not. In this account, the interlanguage differs from the target language in that the parameter for the direction of stress assignment is set to [left]. As stress assignment proceeds from left to right, poe would be placed in head position. Since monosyllabic feet are disallowed, dek would have to be placed in dependent position, and its stress would be obligatorily removed.

This latter account would need to assume a negative setting for extrametricality, since kapistratson, mandadekstra, and pagandekta frequently receive penultimate stress. If extrametricality were set positively, then these penultimate syllables would form monosyllabic feet, thus contradicting the proposed constraint. In native speaker English, monosyllabic feet are allowed in this position, due to a proviso that degenerate feet are to be permitted at the edges of the domain. However, to extend extrametricality and the edge proviso to the interlanguage would undo the proposed analysis of the initially stressed version of poedektal, since dek would be at the edge and thus be permitted to form a monosyllabic foot.

Thus, here we have two quite different groups of parameter settings producing identical results. In the first, a [left] setting of the word stress parameter, a positive setting for extrametricality, as well as either a destressing parameter or a stress conflation process are assumed, while the direction of stress assignment is irrelevant. In the second, a [left] direction of stress assignment, and a constraint on foot size interact, with extrametricality being set negatively, and the setting of the word stress parameter being irrelevant. This second account may be argued to be superior in that it is more constrained in terms of the devices posited, and in terms of the complexity of the resulting derivations, as in the case of first language

English discussed in chapter 2. Another means of coming to a decision between the two would be to look elsewhere in the data for evidence of the parameter settings assumed.

This might be done by looking at the parameter for word level stress assignment, since its functioning can be observed in relative independence from the other parameters. In words with more than one stress, the relative degree of prominence between the stresses is determined by this parameter. In looking at the four syllable words, that were usually rated as containing more than one stress, it can be seen that there is to be great deal of variation in the setting of this parameter with a nearly even distribution between left and right primary stress. That there is so much evidence of the operation of a [left] setting for this parameter is in itself interesting, though, as neither French nor English has this setting. This duplicates the finding of Baptista (1989), although in her study the [left] setting was more clearly dominant (see 3.3.5 for an explanation of why this setting might be adopted for English).

Returning to our competing analyses, we can note that the first one appears to require that most of the learners be using a [left] setting for word level stress, in contradiction with the observed pattern in the four syllable words. However, the problem with trying to test predictions that might be made by these groups of settings is that we are looking at the productions of learners at various stages of development.

Initially stressed poedektal could also be the result of a negative setting for quantity sensitivity combined with left-headed binary foot construction and either setting for word level prominence. In light of this, the only motivation for the choice between the two parameter sets is the aforementioned consideration of parsimony, which appears to favour the second parameter set, though it is admittedly not inconceivable that one might argue the reverse.

Assuming this analysis, the medially stressed version of poedektal would be the result of resetting the direction parameter to [right]. To maintain the initial stress on the words with light medials, extrametricality would have to be reset at this point as well. It is interesting that there are a few cases of each of these words with medial stress, (e.g. tadinet) which would be produced by a [right] setting for the direction parameter, along with the continued absence of extrametricality. This could be conjectured to be a transitional stage.

As mentioned, the obvious explanation for the alternating stress patterns in the four syllable words is that the parameter for foot size (P1) has been switched from unbounded to binary. However, unbounded feet, when constructed iteratively in a quantity sensitive system will produce more than one foot. This fact forces Dresher and Kaye (1990: 192) to postulate a fairly complicated cue for the setting to binary. The difference between the two possible ways of

generating more than one foot is that the unbounded system will only produce stress on light syllables at one edge of the stress domain (i.e. the word excluding any extrametrical syllable) and never on medial syllables. Therefore, the presence of a medial stressed light syllable, or stressed light syllables at both edges (across words), is taken to be unequivocal evidence for a [binary] setting.

Given extrametricality, there are very few medial stressed light syllables in the data, since the only medial syllables are those in antepenultimate position, the penults being at the right edge. Words with a medial light syllable are paridamee, katapestos, and mandadekstra, and only paridamee has any instances of stress on that syllable. However, if we assume that the these learners are for the most part constructing left headed quantity sensitive feet from the left, this is to be expected, even if the feet are binary. In addition, there are many stressed light syllables at both edges of the stress domain. While cross case comparisons are difficult to make because of the problem that different learners at different stages of development with different parameter sets may have produced the various tokens, the large number of stressed light syllables at both edges leads one to believe that at least some of the cases at each edge were produced by the same parameter settings. Less direct evidence of the operation of binary foot construction is the fact that an unbounded account would be forced to explain the unstressed

heavy syllables with a destressing rule, while the binary account would have access to the principled explanation of a foot size constraint put forth above.

To summarize this part of the discussion, the parameter settings posited as responsible for the dominant interlanguage (IL) stress patterns are given in (7), with those for French and English. Starred settings are ones for which there is some, but less evidence for the other setting.

(7)

Parameter	French	English	IL
P1: Feet are	Unbounded	Binary	Binary
P2: Feet are built from the	N/A	Right	Left*
P3: Feet are strong on the	Right	Left	Left
P4: Heavy syllable projection (Quantity Sensitivity)	No	Yes	Yes*
P5: Word level prominence is	Right	Right	Left*
P6: Extrametrical syllable	No	Yes	No*
P7: It is extrametrical on the	N/A	Right	N/A*
P8: Feet are noniterative	N/A	No	No

4.4.2.2 Developmental Results

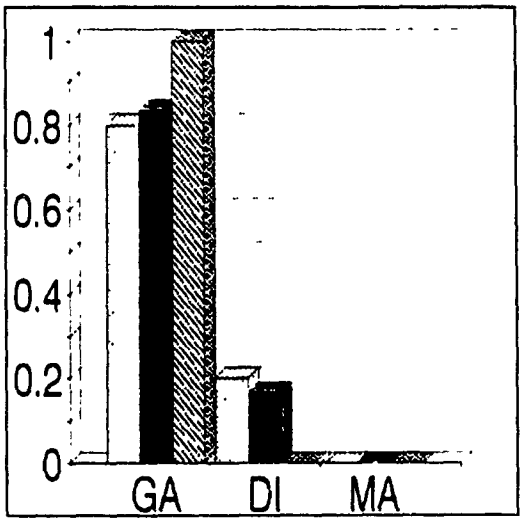
As previously discussed, it was decided to use a cross-sectional design to try to investigate the order of resetting, should resetting be found. There is a great deal of evidence that the learners are not merely relying on their first language settings for the production of these new words. An attempt was made in the above section to describe the

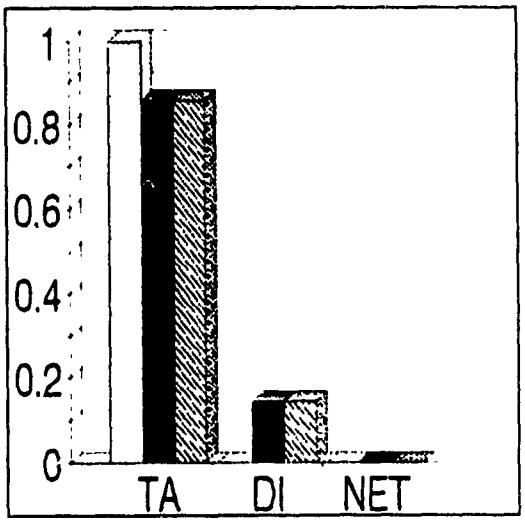
generalizations made by the learners in terms of parameter settings. This was successful, insofar as the similarities and differences between the pronunciations of the various words by the learners and between the learners' generalizations and those of the native speakers, were captured. We now turn to the results for the learners, grouped according to their proficiency, to see if any pattern emerges in the resetting. The parameters we will be most concerned with are those indicated by an asterisk in (7), that seem to vary between the learners, as far as can be ascertained from group results.

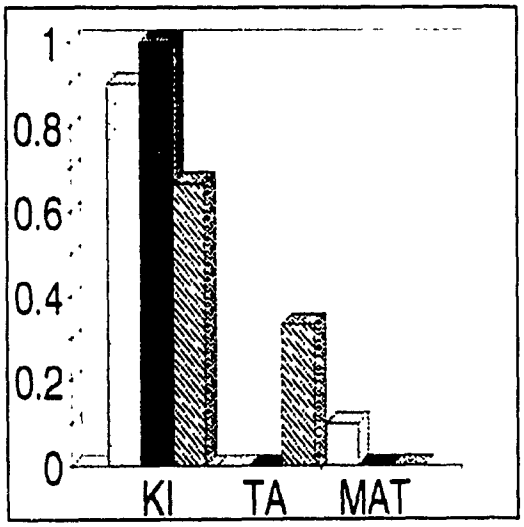
The learners were grouped according to their scores on a standardized language placement test. This test, in a multiple choice format, was not designed to assess either phonology or language production, so it is actually spectacularly unsuited for dividing the learners into groups for the present study. Unfortunately, no other measure was readily available, and it did not seem suitable to ask the unpaid subjects for any more of their time. The mean scores out of 100, were 35.11 (SD 5.07), 53.22 (SD 5.57), and 75.26 (SD 6.24) respectively for each of three groups, each composed of 19 subjects. Since the number of each token differed across the groups, percentages were used instead of raw scores so that the groups could be compared on a single graph. These percentages represent the relative frequency of stress being applied to a specific syllable in relation to the other syllables. Primary and subsidiary stress have been placed onto separate graphs.

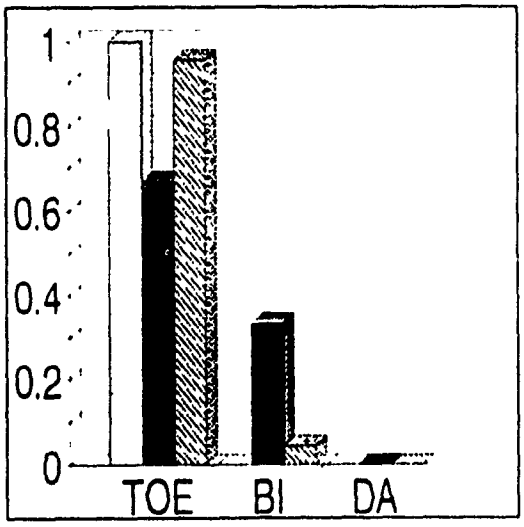
Primary stress is indicated in the graphs on the left side, and subsidiary on the right. For the three syllable words, subsidiary stress has not been included, since it was so rare overall. The scores for the groups are shown beside each other above each syllable, starting with the least proficient group as the leftmost bar.

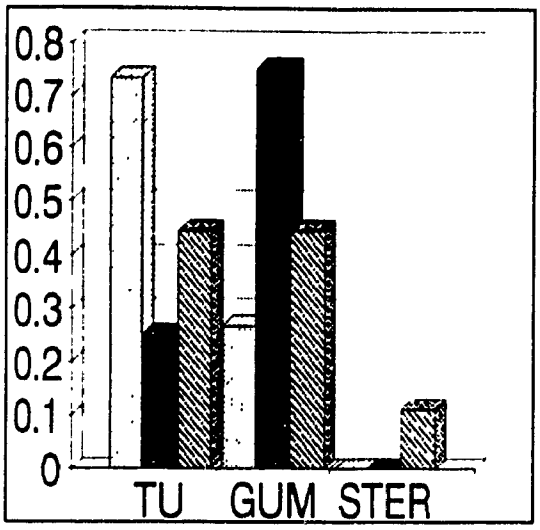
(8) Cross-sectional graphs for three syllable words

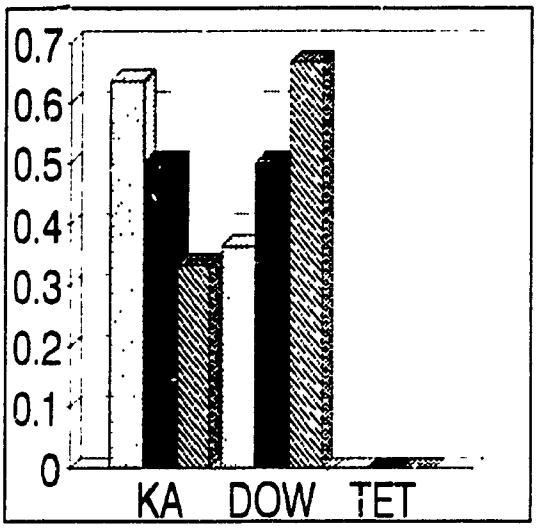


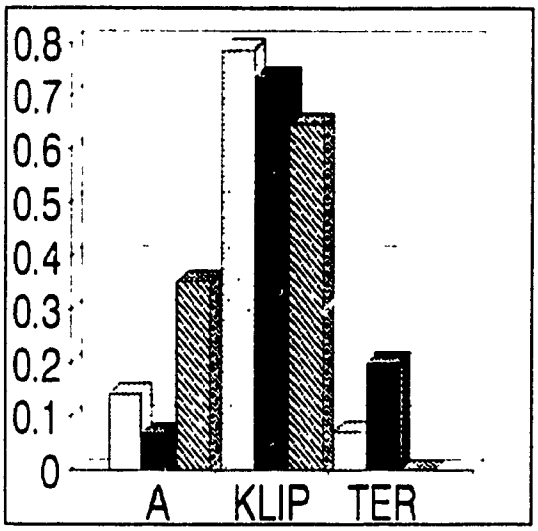


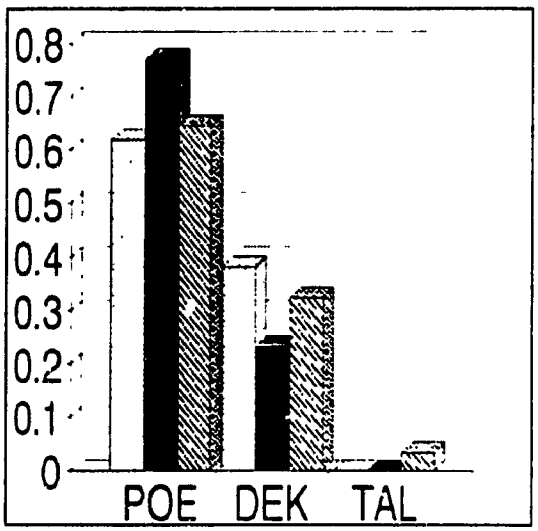










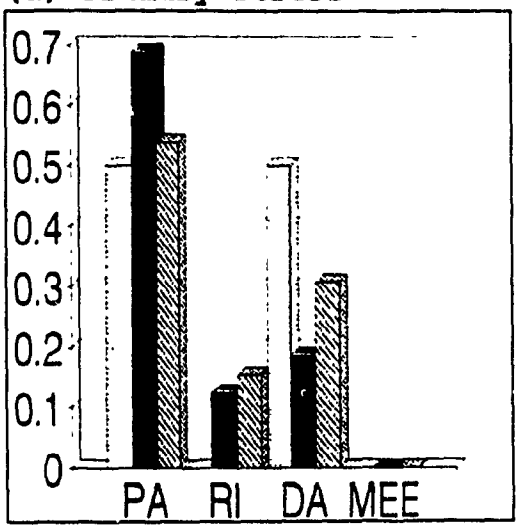


In the three syllable words, any developmental patterns that can be observed in a given word are directly contradicted by another word. The patterns of the first four words, all with light medial syllables, are not of much interest, since they are for the most part initially stressed, across the groups. The second set of four, that all have heavy medials, are potentially of significance for the observation of a developmental pattern for quantity sensitivity. Such a pattern

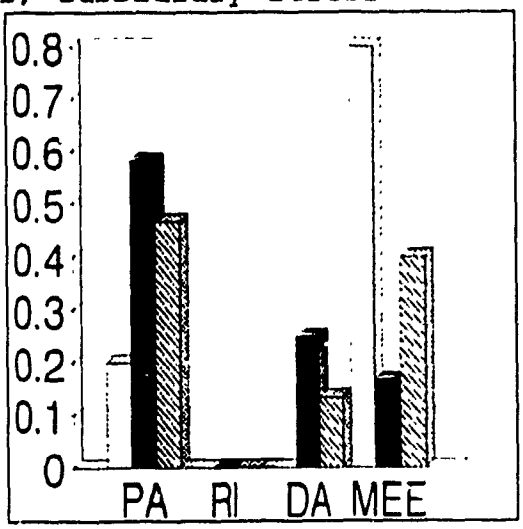
is evident in tugumster and kadowtet, where the group of lowest proficiency stress the light initial syllable most frequently. However, in both aklipter and poedektal, one of the other groups has a higher percentage of stress on the initial syllable. In the results for the mispronunciations, there is a similar lack of evidence for any developmental pattern, so graphs for those words have been omitted.

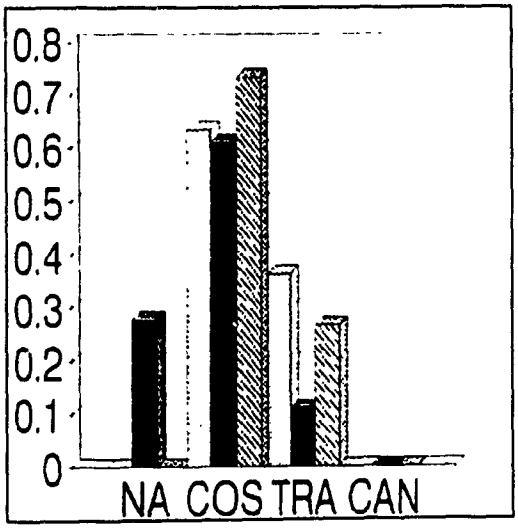
(9) Cross-sectional graphs for four syllable words

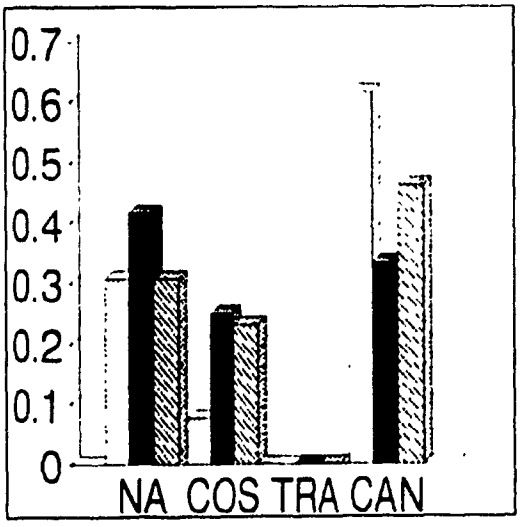
(a) Primary Stress

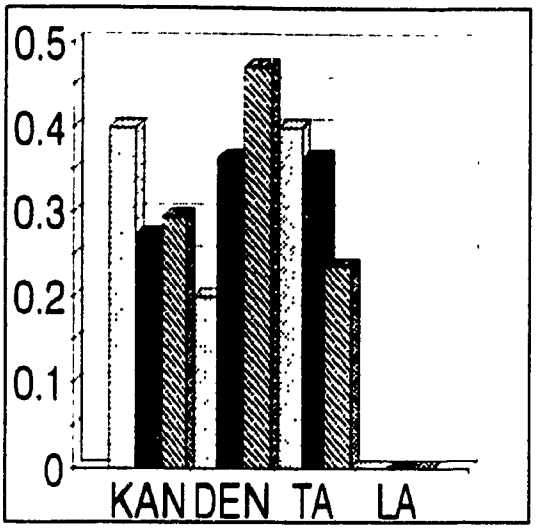


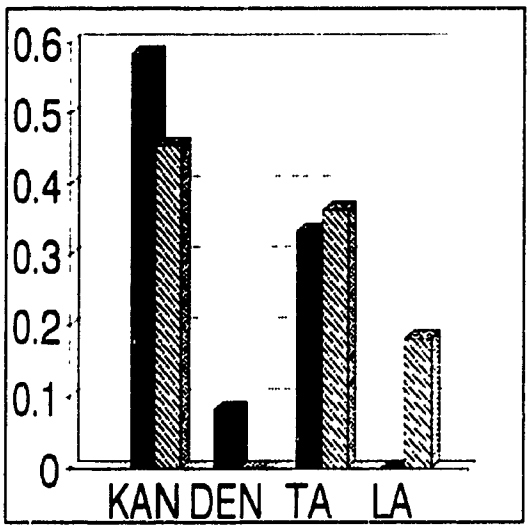
(b) Subsidiary stress








0.5
0.4
0.3
0.2
0.1
0
KAN DEN TA LA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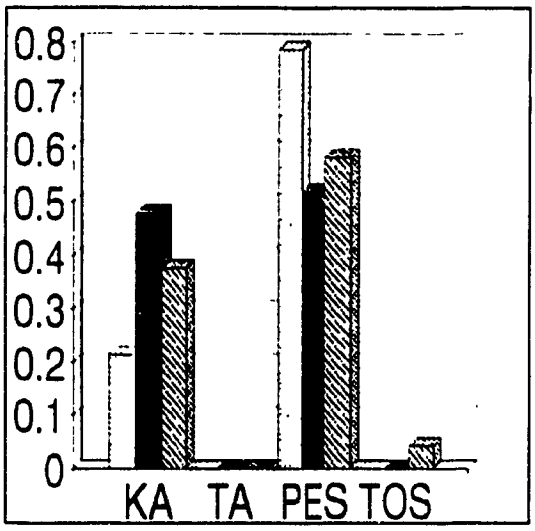
KAN DEN TA LA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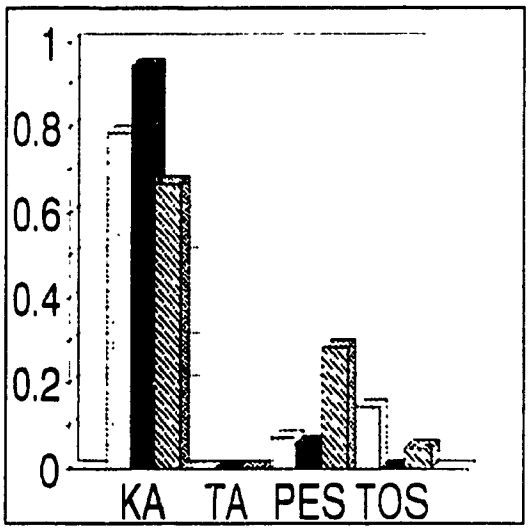
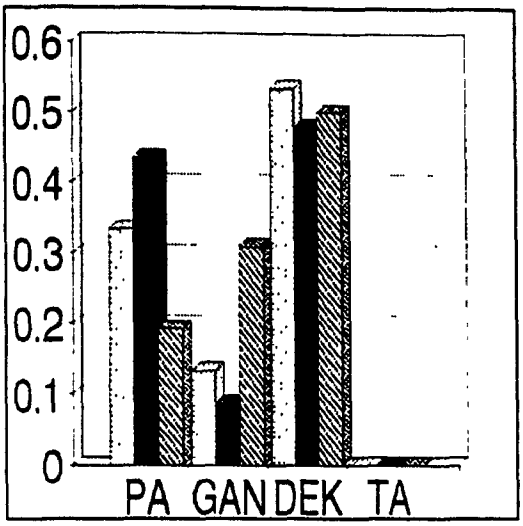
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
KA TA PES TOS


1
0.8
0.6
0.4
0.2
0
KA TA PES TOS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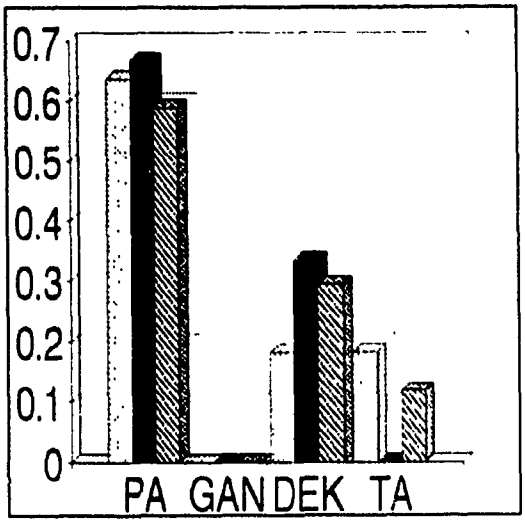
PA GAN DEK TA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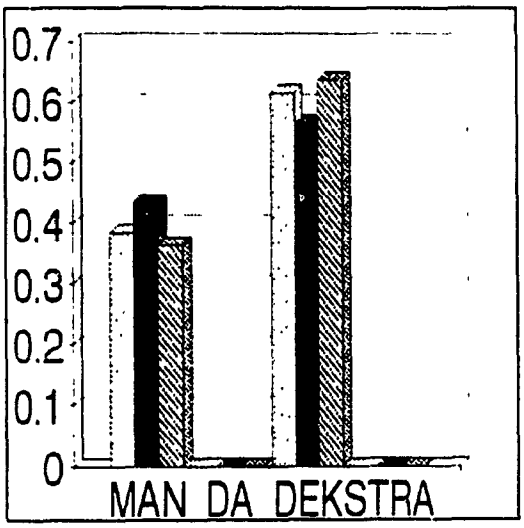
PA GAN DEK TA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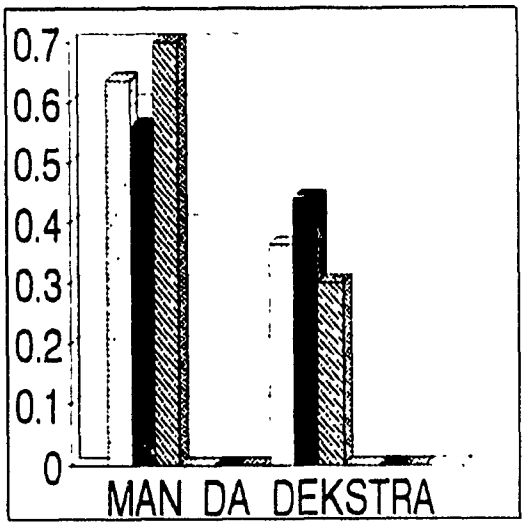
MAN DA DEKSTRA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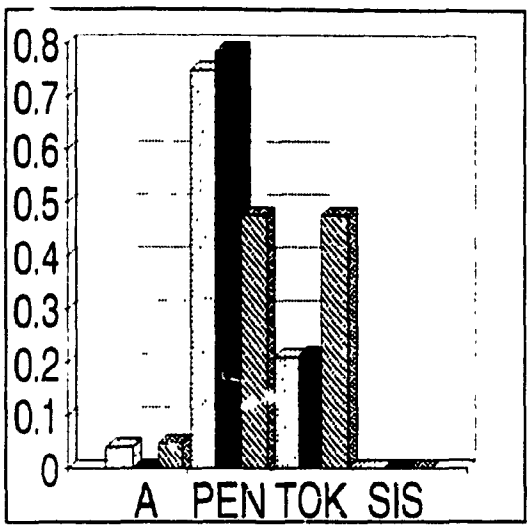
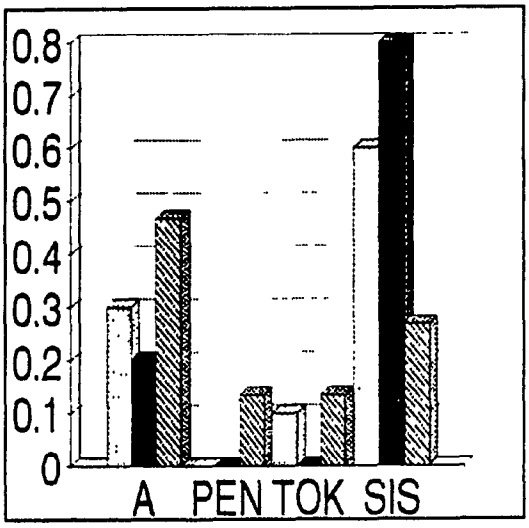
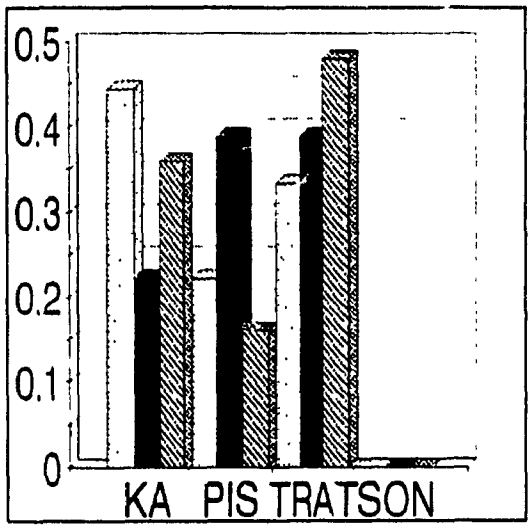
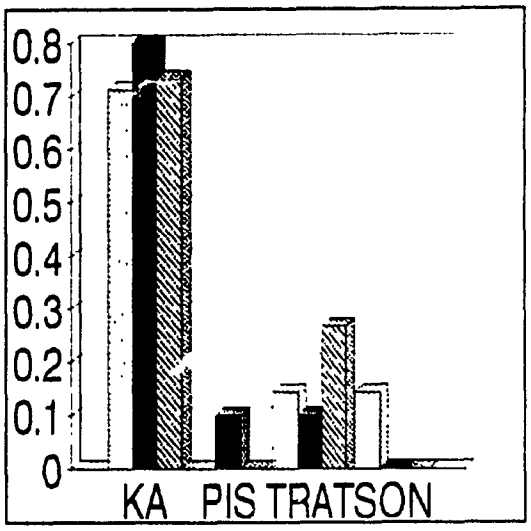
0
MAN DA DEKSTRA









The patterns across the groups in the four syllable words are also contradictory. For example, katapestos and pagandekta have a greater amount of rightmost primary stress exhibited by the lowest proficiency group, while apentoksis and kapistratson show the opposite trend.

The only thing to be concluded from the cross-sectional data is that they are not consistent enough to support any

conclusions. This is most likely the result of an inappropriate measure having been used to group the students. In this study, the only developmental hypotheses that emerge are those that can be drawn from looking at the overall results. On the basis of those data, one might speculate that French learners of English set the parameters for headedness of feet (P3), iterativity (P8), and boundedness (P1), to English values before those for the direction of foot construction (P2), quantity sensitivity (P4), extrametricality, and word level prominence (P5). There is, however a great deal of further research, in terms of the types and quantities of words to be tested, that would allow strengthening and improvement of the theoretical account of the observed regularities, and thus permit a refinement of the quite broad and speculative developmental hypothesis mentioned here.

4.5 Conclusions

4.5.1 Research questions

This study was undertaken to address at least one, and possibly two questions:

1) Do French learners of English reset metrical parameters?

2) If so, can an order be observed in the resetting?

Clearly, the results presented here bear far more directly on the first question. Given the assumptions underlying this study, it appears to provide some impetus for a positive

answer to this question, since a great deal of regularity was shown to exist in the pronunciation of previously unheard words by the subjects, and since this regularity was for the most part explicable only on the basis of parameter settings that were different from those of the first language settings. At this point two basic assumptions that might be questioned by a thoughtful reader will be discussed, not to prove their validity, but rather to show that they are at least reasonable.

Whether the knowledge of second language stress is instantiated in terms of strategies for the placement of stress, or in terms of reset parameters, is probably untestable empirically. There are, however, several considerations that motivate a parameter analysis. As was discussed in the introduction, it is extremely unlikely that these learners have been taught conscious strategies for the placement of stress. It could be argued, however, that these learners have developed some sort of unconscious strategies for stress placement. This is completely possible, but there exists no theoretical framework, besides that of metrical phonology, for explaining why the words are not stressed identically, or why the stress patterns are produced differently than by the native speakers. Within a parameter framework it is possible to provide a quite illuminating explanation for the similarities and differences between the stress patterns of the various words, and between the learners

and native speakers of English. And finally, if we assume that parameters are responsible for the regularities in first language stress placement, why should we assume that different cognitive processes are responsible for such regularities in non-primary languages, unless we adopt an a priori position that Universal Grammar is inaccessible for the second language learner?

Another objection that might be raised is that this task is too 'monitored', and that it is not a valid measure of parameter settings, and that a more realistic appraisal of these learners' competence would be in a more naturalistic task, where there would probably be more use of the first language settings. However, as just mentioned, it is difficult to imagine where these learners' knowledge of stress comes from, if not from the parameter settings. That there might be more use of first language settings in more natural speech is quite possible. It was remarked in note (6) to this chapter that though the vast majority of forms had no final stress, final subsidiary stress was sometimes noted by the raters. This was ascribed to the ability of the learners to use the parameters of either language. This ability, it was suggested, could be the result of two non-exclusive possibilities. The first was that English and French stress are not linguistically equivalent. Stress is marked in French by a change in pitch, but not intensity, or duration, while all of these phonetic features are used in English. Also, English

stress can function to contrast meaning or to emphasize, while these functions are usually performed syntactically in French (Allen 1982: 119). While this hypothesis subverts much of what has been said about the differences in parameter settings in the two languages, it remains a possibility. Another explanation that would not involve a radical change to the premises of this work would be that transfer can occur even after parameter settings for the second language have been established. This would be possible if one adopted the widespread view of the use of first language grammatical forms as a strategy, rather than a set of behaviours to be overcome (Cf. Kellerman & Sharwood-Smith 1986). James (1989) takes this view of transfer, or cross-linguistic influence, and develops a model of phonological competence and processing in which the processor has access to settings from both the first and second language. First language settings would be used by the processor when faced with a problem, such as the lack of second language settings for a form, or if under communicative pressure to perform at a rate not possible in conjunction with the developing grammar.

Even if for some reason, like an atheistic feeling about the existence of UG, the parameter based analysis is deemed unacceptable, there is a larger conclusion that can be drawn from this study if it is considered a valid measure of some kind of linguistic knowledge. English stress is on the surface quite complex, and contains many exceptions to the

generalizations made about it in chapter two of this thesis. In the face of this complexity and exceptionality, one might reasonably assume that all second language learners do in terms of learning English is to lexically store the patterns of the words they encounter. At the very least, the behaviour of these learners provides some counter evidence to this assumption, and attests to the strong tendency toward linguistic generalization that Hochberg (1988a) found so striking in her first language developmental study.

This research is still in its primary stages, and is a long way off from providing any prescriptions for the teaching of English as a second language, if it ever will. However, there is one conclusion of relevance to second language pedagogy that does seem to follow, if we can believe that the findings in this far from perfect study are somewhat valid. That is, learners of second language do make generalizations about the language they are learning, even when these generalizations are never explicitly taught.

4.5.2 Limitations and directions for further research

In this study, each distribution of syllable weight was represented by only one or two tokens. A limitation on the scope of this study that is imposed by the small number of tokens includes the inability to make statistical comparisons across tokens of a similar configuration in order to check consistency of stress placement, both within an individual's

responses, and across a group. If a large amount of inconsistency in terms of the relevant parameter settings were found, especially within individual results, this would constitute quite strong evidence for a pure lexical storage mode of learning stress, as seems to be the case in the earliest stages of first language acquisition, as discussed in chapter three, and would be strong counter evidence to a claim that second language learners are using metrical parameter settings. Also, specific hypotheses about the nature of the second language metrical parameter settings would be better addressed with the use of a greater number of tokens.

Another weakness of this study was that a large amount of data had to be omitted from the analyses due to the various pronunciations the subjects used for the test words. The simplified spelling system was not a very successful controller of this variability, probably because reading habits cannot be overcome in five minutes. One approach that might be more successful would be to present words aurally at a slow speed, with the syllables stressed evenly. The task would then be for the learners repeat the words at a more natural tempo. This task could posssibly be disguised as a vocabulary learning task, as in Broselow and Finer (1991), so as to render the subjects blind to the purpose of the study, though teaching nonsense words as real vocabulary items might not be entirely ethical. As well, using an aural methodology of this kind would permit the inclusion of pre-literate

children as subjects, perhaps using some sort of 'wug' test.

More positively, this study does provide impetus for the creation of more carefully planned developmental studies, since there is evidence for a great deal of parameter based consistency, within the limited number of words studied. It was not possible to address developmental issues in the present investigation, probably because of the inability of the proficiency test to group the subjects appropriately. Finding an appropriate measure to divide subjects into pseudo-developmental groups is clearly a priority for future work. As well, the use of nonce words holds promise to be a fruitful methodology for the study of first and second language parameter setting. And lastly, the inclusion of subsidiary stress rating, done for the first time in this study, while creating some difficulties, would appear to be a methodological imperative in future studies of stress for two reasons. Firstly, it imparted the ability to uncover underlying consensus between raters where only dissent would be seen with the use of an exclusively main stress rating scale. Secondly, it would have been impossible to ascertain the setting of the binary/unbounded parameter without any knowledge of the subsidiary stress patterns. With such a richly interacting set of parameters, the analysis of the stress patterns produced by these French learners of English would have then been impossible.

Notes for chapter 4

1. Another assumption might be that the learners revert to the unmarked settings of parameters. Of the two assumptions, the one of transfer of first language settings appears to be more credible in light of the empirical studies done in syntax. For discussion, see White (1989a).

2. Prepared as a term paper for Dr. L. White's course in Second Language Acquisition at McGill University in the spring of 1991.

3. The weights for the final syllables are actually somewhat problematic, given that since Hayes (1981) final consonants have generally been assumed to be extraprosodic in English. Whether the subjects would treat these consonants as contributing to syllable weight is hard to know. However, as we shall see in the results, this does not present much of a difficulty in the present study since final syllables are very rarely stressed by either the first or second language speakers of English.

4. A judgment task in which the subjects heard each word stressed in three ways and were asked to choose the pronunciation which they thought was correct for English was also used. However, as discussed in Pater (1991), the native speaker results for this task were quite inconsistent, in contrast with the production task. There are two possible explanations for this. One is that stress assignment is primarily a productive, rather than receptive process. Psycholinguistic research has tended to show that stress actually plays a very small role in lexical access-a misstressed word is not usually difficult to recognize, even though it is lexically stored (Cutler 1986). A second factor is that in English, emphatic stress can be used to accentuate any syllable in a word. Thus, under certain circumstances, any of the pronunciations would be possible.

5. The fact that the initial syllable was not reduced in these cases could lead to that syllable being classified as stressed. This would also be the case in several of the pronunciations of poedektal, when the initial syllable surfaced as tense. However, since they had no neighbouring unstressed syllables, there was no way of perceptually gauging their relative prominence.

6. There are a few cases in which the final syllable was marked as stressed, usually subsidiarily. Possible explanations for the raters' perception of some final stress are that English and French stress are not really manifestations of the same linguistic process and/or transfer can occur after parameter settings have been established. These possibilities will be discussed in more detail in the concluding section. In any case, the instances of final subsidiary stress are but a small percentage of the total sample, most of which involves no final stress.

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Appendix- Test words as presented to the subjects

Vowel list	
see-cleen, teem, meen	**bat**- class, task, last
bit-hit, kit, fit	d**ay**-hayt, dayt, say
yes-rest, test, less	**mom**- Tom, long, song
herd-berd, therd, ferst	**toe**- goe, soe, bloe
bus-tuch, luv, blud	**cow**- how, lowd, showt

1. ta.di.net
The tadinet is on the floor.

2. ka.ta.pes.tos
Ka.ta.pes.tos is found in South America.

3. tu.gum.ster
The tugumster ate its meal.

4. kan.den.ta.la
The kandentala is extinct.

5. toe.bi.da
A toebida can be found in Manitoba.

6. man.da.dek.stra
The mandadekstra is a rare bird.

7. ka.dow.tet
A kadowtet is hard to find.

8. na.cos.tra.can
The nacostracan has a soft shell.

9. poe.dek.tal
My poedektal was hit by a ball.

10. ka.pis.trat.son
The kapistratson is a musical instrument.

11. ki.ta.mat
A kitamat is a small reptile.

12. pa.gan.dek.ta
A pagandekta is a very tall tree.

13. ga.di.ma
The ga.di.ma lives in Africa.

14. pa.ri.da.mee
The paridamee is an old dance.

15. a.klip.ter
An aklipter is a scientific instrument.

16. a.pen.tok.sis
Apentoksis is a terrible disease.