A CONTRASTIVE ANALYSIS OF SPANISH AND FANG: AN L2 APPROACH TO EQUATORIAL GUINEAN SPANISH AS SPEAKEN IN BATA CITY

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A CONTRASTIVE ANALYSIS OF SPANISH AND FANG: AN L2 APPROACH TO EQUATORIAL GUINEAN SPANISH AS SPOKEN IN BATA CITY

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ABSTRACT

Previous studies on Equatorial Guinean Spanish (EGS) have described this dialect as being heavily influenced by the L1. For example, Granda (1985), Lipski (1985), and Quilis & Casado-Fresnillo (1995) maintain that failure to spirantize voiced stops may be a reflection of the L1 grammar which does not employ the spirantization rule. Other phenomena such as alveolar place of articulation of dental [ǁ] and [Ɂ] and the simplification of /Cr/ onset clusters have also been attributed to negative transfer of the L1 structure. Although the L1 clearly influences EGS, not all phenomena such as syllable repair, segment deletion and debuccalization can be attributed to L1 transfer, but also to markedness and developmental factors. For example, learners of an L2 may employ strategies in the interlanguage to simplify complex syllable clusters (e.g. Hancin-Bhatt et al. 1997; Broselow et al. 1998). They may also employ a word integrity effect (Cebrian, 2000) where words may be produced as entire units avoiding L2 word binding phenomena such as resyllabification.

A framework for determining the influence of the L1 on the L2 is the Contrastive Analysis Hypothesis (Fries, 1945; Lado, 1957: CAH) which involves an item by item comparison of L1 structures and rules to those in the L2. More contemporary versions of the CAH go beyond the segment by segment analysis and incorporate the concept of markedness (e.g. Greenberg, 1966, 1976; Jakobson, 1941; Trubetzkoy, 1939) in order to account for phenomena in L2 production
that are not as clearly traceable to the L1. For example, Eckman (1991) claims that universally marked items in the L2, even if they exist in the L1, will be the most difficult for learners to acquire.

To date, Equatorial Guinean Spanish has not been submitted to formal CAH analysis so the exact influence that the L1 has in the L2 is unclear. The present study performs a CAH analysis between certain target items in Fang and Spanish to clarify which phenomena in the L2 are attributable to the L1 and which can be described as the result of developmental factors. The results reveal that both transfer and developmental factors play a significant role in the production of EGS as spoken in Bata City.
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Introduction

Equatorial Guinea represents the only country in Sub-Saharan Africa where Spanish serves as the official language. Typically learned as an L2, Spanish in Equatorial Guinea exists in contact with other, primarily Bantu, languages, e.g. Fang, Bube, Batanga, Bujeba, Ndowe, Visio etc., as well as with local creoles, e.g. Pichi (English), Anabonés (Portuguese). Of the L1s of Equatorial Guinea, Fang (Bantu A-70), is by far the most representative with over 300,000 native speakers in a country with a population of roughly 500,000.

Over the years Equatorial Guinean Spanish (EGS) has captured the interest of researchers working in the field of Hispanic dialectology due to its unique character and language contact ecology. Since Spanish is learned as an L2 in Equatorial Guinea¹ and phenomena such as L1 transfer and universal grammar have been shown to influence L2 acquisition, a systematic analysis of EGS should take the structures of the L1 and the L2 into account as a basic point of departure. Otherwise, analysis of L2 production will reveal a wide range of transferred structures from the disparate L1 grammatical systems resulting in a description characterized by excessive variation, e.g. Quilis & Casado Fresnillo (1995) report no less than 14 allophones in the production of Spanish /x/ and /n/.

At the present point in time researchers of EGS are only equipped to perform contrastive analysis on Spanish speakers from Equatorial Guinea who speak Fang or Bubi as the L1. Unfortunately, the latter two languages are the only L1s of Equatorial Guinea that have received some degree of descriptive analysis, save for Pichi which serves mostly as a lingua franca in one

¹ It is mostly learned by populations with access to education.
specific geographical area\textsuperscript{2}. The other option is to perform an independent study of the L1s that have not received any other linguistic description to date. Through the years, however, Hispanic linguists have had to rely on extant grammars such as Bibang Oyee (1990) in the case of Fang and Bolekia Boleká (1991) in the case of Bubi for access to these languages.

Based on personal observation and references such as Liniger-Goumaz (2000) as well as discussions held at the Centro Cultural Español\textsuperscript{3}, the current state of Spanish in Bata, EG can be broadly described in terms of the diversity of the population dynamics of its speakers, which can be divided roughly into five groups; 1) urban-born residents, 2) rural-born residents, 3) regional foreign immigration, 4) non-regional foreign immigration, 5) speakers from the ‘lost generation [la generación perdida].’

*Urban-born residents* are those who were born and raised in urban environments such as Malabo or Bata. These speakers were exposed to Spanish at a very early age and thus have the opportunity to establish a solid linguistic base due to the fact that most of the schools, and thus the best educators, are located in the urban areas. The *rural-born residents* differ from their urban-born counterparts in that the age of exposure to Spanish hinges upon the time their parents, or themselves alone, migrate from the rural countryside to the cities. Their level of proficiency depends on the time of exposure and typically the earliest-exposed speakers obtain a higher level. In many cases speakers from these groups do not get their first significant exposure until they reach their early teens depending on the time their parents migrated. The category of *regional foreign immigration* is mostly composed of residents from Southern Cameroon and northern Gabon. Attracted by the economic boom and the relative cultural similarity, these

\textsuperscript{2} Pichi is mostly spoken as a lingua franca in Malabo, the capital city on Bioko Island.

\textsuperscript{3} Discussions with M. Ekomo, educators, and directors at the CCE (Centro Cultural Español) in both Malabo and Bata helped to inform this assessment.
immigrants have made their homes mostly in Bata, which is considered the economic capital of the country located in the Río Muni littoral. Linguistically speaking, the principal challenge for new arrivals is the learning of Spanish, as the great majority are Fang L1s\(^4\) with French being their original L2. There is a significant age difference between this group and the rural migrant group in that the age of exposure to Spanish is typically much later (some recent arrivals may be in their thirties). The *non-regional immigrant* group is mostly composed of immigrants from Spain, China, and Lebanon who are either business owners or employees of foreign companies with operations in Equatorial Guinea. The native Spanish speakers have no problem with adapting linguistically save for acquiring some local semantic items and expressions, e.g. names of locations, food items etc. The peninsular Spanish accent is typically viewed in EG as the model to follow. The latter two groups find Spanish to be a challenge as the structure of their L1 is significantly different and the L2 is often heavily accented. Between these groups and the native Equatorial Guineans (as well as other foreigners) there is often a certain amount of meaning negotiation that must take place upon communication of each party’s message. The final group, which is referred to as “*the lost generation,*” is composed of those speakers whose formative years were heavily influenced by the oppressive Macias Regime from 1968 to 1979 where the utilization of any language other than Fang was discouraged or even prohibited. Whereas speakers from the other groups are defined by geographic location, the members of this group are defined by their exposure to the ideology of the political regime, thus the geographic place of origin of its members is negligible. Members of this group are generally in their late forties and fifties and engaged in learning Spanish in their teens or when the Macías regime was terminated.

\(^4\) Although the dialects are different, Fang speakers from the three countries have little difficulty in being mutually understood.
The stance of the present study is that Spanish in Equatorial Guinea is most accurately described as a second language as opposed to an established dialect of Spanish based on how it is spoken by the representative speakers of the different L1s of the country. Most Equatorial Guineans themselves will admit that Spanish is their L2 and often times they will apologize for not having complete control of the language. In this view one is more accurate in referring to “Fang, Bubi or Pichi-influenced Spanish” rather than referring to one homogeneous dialect. In taking a first step to test this view the study performs a contrastive analysis on specific phonological structures between Fang and Spanish. A set of predictions are then formulated and subsequently tested through L2 acoustic and phonological analysis.

The study utilizes the strong version of the Contrastive Analysis Hypothesis (e.g. Lado, 1957) for the initial framework in which to compare the phonological systems in question. As is characteristic of CAH studies, a series of predictions as to how these certain structures will be produced in the L2 are proposed. The study then diverges from the strong version of the CAH by testing these hypotheses on spoken L2 data as a way in which to confirm or reject them. The results are also analyzed for possible features that could not have been predicted through the CAH.

The present study is organized in the following manner. Chapter 1 outlines the significant approaches to L2 phonological acquisition since the middle of the previous century. The description starts with the Contrastive Analysis Hypothesis (Fries, 1945; Lado, 1957) and ends with a broad description of the concept of Markedness as a factor in L2 acquisition. Chapter one also introduces the theoretical phonological frameworks selected for the study. A review of the phonological observations in previous studies of EGS is given in Chapter 2, which starts with Granda (1985), then examines Lipski (1985), and then finally Quilis & Casado-Fresnillo (1995).
Chapter 3 provides a contrastive analysis of the phonological systems of Fang and Spanish target items utilized in this study. At the end of Chapter 3, the hypotheses for L2 production are presented. Chapter 4 gives a description of the methodology used in the study. Chapter 5 reports the results of the phonological and acoustic phonetic analyses. Chapter 6 consists of a discussion of the results, a conclusion, limitations of the study and suggestions for future research.
Chapter 1

1. Contrastive Analysis Hypothesis

The initial inquiries into L2 acquisition relied heavily on the concepts of language transfer; a concept that was originally introduced in behaviorist psychology (e.g. Skinner, 1935; 1953, 1957). The idea of L1 transfer promoted the notion that production errors committed in the L2 were defined in terms of structural differences with the L1. Such an approach was promoted by the Contrastive Analysis Hypothesis of University of Michigan professor Charles C. Fries and later by his protégé Robert Lado.

In presenting his argument in favor of a contrastive model Fries explains that human beings must learn the L2 grammar in a similar manner in which they learned the grammatical system of the L1. With respect to the process of L1 acquisition, Fries simply states that it is an unconscious activity over which humans have no control. The grammatical system of a human language is described as being mastered in the same way children learn to walk; naturally and unconsciously without any significant instruction. Once the grammatical complexities are worked out, they become habits incorporated by speakers throughout their lives.

In Fries’ view the adult second language learner must first become aware of the language structure, i.e. the syntactic, phonological, and morphological rules, and then practice them enough so that they eventually become second nature. However, as observed by Fries himself, L2 oral production is not always perfect and exhibits traces of “foreignness.” For Fries, the source of the errors stemmed from the habits of the L1 that are thought to be so ingrained in the learner’s mind that they are virtually impossible to relinquish upon L2 acquisition.

In addressing potential L2 production errors, Fries emphasizes the importance of carrying out detailed contrastive analyses of both languages. Through this type of parallel description
researchers are able to predict and possibly prevent L1 interference through preemptive pedagogical treatment.

While performing phonological contrastive analysis it was thought to be of particular importance to identify and expose learners to those sounds which constitute phonemic contrasts in the L2. For example, in teaching English to native speakers of Spanish, according to Fries, it is of little importance to expose learners to the articulatory differences between English alveolar /t/ and /d/ versus Spanish dental stops /χ/ and /ʝ/ since these distinctions cause no phonemic contrast. However, it is imperative to exhibit how contrasting sounds such as /s/ and /z/ can result in critical breaches in message transmission in some languages. Other difficult impasses were thought to be observed in the acquisition of L2 phonotactic information such as the acquisition of complex codas or onsets absent from the L1.

It is important to note that the goal of the Contrastive Analysis was strictly methodological. That is, by proposing a predictive mechanism researchers and teachers were able generate materials to stop errors in their tracks. Most of the materials were incorporated in the curriculum in the English Language Institute at the University of Michigan, where drilling and habit formation was said to play an important role. As noted in Thomas (2004), it is through this association to pedagogy that the framework was associated to Behaviorist learning theories of the day. However, according to Thomas, the act of performing a contrastive analysis in and of itself does not necessarily promote Behaviorist or Audio-lingual ideas.

Further elaborating the tenets of the CAH, Fries’ pupil Robert Lado reinforces his mentor’s proposals fourteen years later in Languages in Contact (Lado, 1957). That is, Lado emphasized the importance of L1 and L2 analysis and how contrasts must be addressed through rigid methodological application. Lado, however, distinguishes his work somewhat from that of his
predecessor by showcasing the importance of the predictive powers of the CAH. The proposal, which is referred to as the “New Approach” is designed as a device of grammatical error prevention, again forming indirect links to psychological learning theories of the time.

In conducting Phonological Contrastive Analysis (PCA) the phonological systems of the L1 and the L2 are compared on a parallel basis. The comparison is based on phonemes, distribution of phonemes, as well as suprasegmental phenomena. A particular emphasis is given to the importance of phonemic contrasts in the L2.

The individual sound analysis in the CAH begins by stating that similar phonemes sharing similar distributions in both languages are thought to result in positive transfer between the two languages. These are the cases, according to the CAH, that present hardly any learning obstacles for learners. On the other hand, those sounds in the L2 that have no equivalents in the L1 or are distributed differently than in the L1, are assessed as presenting the most difficulty. In addressing such cases the CAH claims that when new sounds or distributions thereof have to be learned, acquisition is slow and thus the majority of pedagogical efforts should be focused on these differences. Similarities between the L1 and the L2 are thought to transfer automatically without any particular effort.

In directly addressing how to conduct a comparison between two sound systems Lado presents three important questions on which it should be based:

1) Questions on which CAH analyses are based (Lado, 1957)

1. Does the native language have a phonetically similar phoneme?
2. Are the variants of the phonemes similar in both languages?
3. Are the phonemes and their variants similarly distributed?
If the target language possesses phonemes that are absent in the L1 it is thought that the learner will substitute these phonemes with its structurally most similar equivalent. An example provided in Lado is given between Portuguese as an L1 and English as an L2. For Portuguese speakers the English phonemes /ʃ dʒ θ h r y w/ are absent and are predicted as being difficult to produce as well as perceive in spoken discourse.

Another example of inventory differences is given with Peninsular Spanish as the L1 and English as the L2. Since the former does not have the English /v ð z ʒ ʃ dʒ/ phonemes, these are expected to result as inaccurate in the spoken production of English by Spanish L1s. Although Lado makes the claim that both spoken production and perception will be difficult in respect to these sounds, Lado stops short of assessing perception as a direct link to spoken production. This is important in characterizing later criticisms and challenges to the CAH which argue that it does attempt to elaborate a theory between perception-production (e.g. Nemser, 1961; Briere, 1968).

In the first phase of CAH implementation, phonemes of the L1 and the L2 are compared one by one based on points of articulation, e.g. velar, alveolar, dorsal etc. and mode of production, e.g. stops, fricatives, affricates etc. However, Lado admits that this type of analysis is incomplete because it offers very little insight into phoneme variants. If the similar phonemes between the L1 and the L2 also have phoneme variants then this may also result in difficulties.

A classic example of such a case is the phoneme /d/ for L1 Spanish students acquiring English. On the surface it seems as though /d/ would not pose a problem for Spanish L1s as both languages include this sound. However, in Spanish this phoneme has a well-defined variant when it is flanked by phones with the [+cont] feature, e.g. /s/, /ʃ/, all vowels etc. In this context
the /ð/ becomes the voiced dental fricative [ð], e.g. /ˈdɛdə/ -> [dɛdə], /ˈædə/ -> [aðə].

Spirantization also occurs when /ð/ occurs in word final position without being followed by a segment, e.g. /ˈpiedə/ -> [pjeðað] (mercy), /ˈpærəd/ -> [pærəð] etc. As a result of the L1 phonological processes that apply to /ð/, similar contexts will yield the same result in English, e.g. /ˈlæðəɻ/ (ladder) -> [læðəɻ] (lather). Essentially, what is happening is transfer of an L1 allophonic variant surfacing as two separate L2 phonemes; i.e. /d/ and /ð/.

Another example is the production of English /d/ and /t/ which surface as [ɾ] when occurring in intervocalic unstraessed syllables, e.g. /ˈbætəɻ/ -> [bæɾəɻ], /ˈbɔtəɻ/ -> [bɔɾəɻ] etc. In terms of the CAH, a hypothesis could be formulated stating that English L1 will produce unstressed intervocalic /d/ in Spanish as [ɾ].

Although allophonic variation is critical to L2 acquisition, Lado points out that certain features between L1 and L2 sounds are negligible. Such inconsequential differences are those involving phonetic details that do not result in phonological contrasts. One example of such a difference is the contrast in articulation between Spanish and English /d/. In Spanish this sound is pronounced with the apex of the tongue making contact with the back of the front teeth and in English it is pronounced with the active articulator touching the alveolar ridge. As neither Spanish nor English generate lexical contrasts based on the dental feature, this difference is considered as non-critical. If native speakers of Spanish produce words such as English /dej/ (day) as /dej/, native speakers of English are likely to understand them as foreign-accented speakers. In light of cases such as these it is left to the discretion of the researcher and the goal of their study to decide what phenomena should or should not count as significant. This is a point that remains unclear in Lado’s discussion. In his view, if the contrast doesn’t result in a different

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5 These allophones are more accurately described as “approximates” rather than “fricatives.” This detail is further elaborated in chapter 3.
structural interpretation then it can be considered as negligible. Some studies have revealed, however, that having a foreign-sounding accent inhibits acceptance into the wider L2 community (e.g. Lippi-Green, 1994); an important observation for learners who aspire to integrate themselves culturally in the country where the L2 is spoken. Under such circumstances factors such as phonetic variation would qualify as potential material for CAH analysis. On the other hand, if learner goals are to communicate effectively in the L2 irrespective of accent, then such phonetic detail would be of minimal importance.

In addition to phonetic equality and variance, the CAH emphasizes the importance of phoneme distribution. Lado exemplifies this point by contrasting the differences between the voiced palatal fricative /ʒ/ in French and English. Although both languages have this phoneme, French allows it to occur in word initial position while English does not. Because of this distributional distinction Lado argues that English L1s will find /ʒ/ in word initial position difficult to acquire. As will be seen later when covering the concept of Markedness, Eckman (1977) discovers that English L1s have a less difficult time at producing /ʒ/ in word initial position in French than German L1s, for example, where /ʒ/ is not part of the L1 phonemic inventory.

In further elaborating the concept of contrast in distribution, Lado shows how consonantal sequences and syllable structure are also essential for performing a CAH analysis. As an example of contrasting consonantal sequences, Lado uses the English /θr/ in words like three and thrash. In Spanish, the CAH predicts that speakers will have significant difficulties in producing this sequence as it is nonexistent in the L1. In emphasizing the role of syllabic position Lado states that although Spanish and English both have /sC/ sequences, they do not occur in word initial position in Spanish and thus are very difficult for Spanish L1s to acquire. Native speakers
of Spanish typically produce the complex /sC/ onset in English with an epenthetic /e/ before the /s/, thus breaking up the complex cluster into two separate syllables, /spaj/ (CV:) -> [es.paj] (VC.CV). The sequences which are allowed in the L2 but not in the L1 can be predicted as being difficult when producing the L2. Lado also adds that the same idea holds for the syllabic coda position.

In providing examples of the practical implementation of their approach both Fries and Lado encountered major obstacles and theoretical flaws when treating the non-obvious cases of language transfer. In Fries, this becomes evident when transfer is considered the motivation for segmental deletion in complex codas from L1s with only simple codas, i.e. since there is no coda simplification rule in the L1 this repair cannot be intuitively attributed to L1 transfer. Thus, the act of deleting segments seemed to be a phenomenon obtained as a result of the learning process and not necessarily an outcome of transfer.

Lado also encounters a major obstacle that the CAH cannot accurately predict when contending with substitution of L2 sounds. As the CAH describes, if a phoneme in the L2 is absent from the phonemic inventory of the L1 the most similar sound by way of distinctive features from the L1 is transferred. This presents a major problem when phonemes from the L1 act as replacements even though they are not potential transfer candidates. The specific example detailed in Lado exhibits transfer selection by native Spanish, Japanese and Thai speakers when learning the voiceless interdental phoneme /θ/ of English in words like think, thanks, anthem etc. The problem is that each language seems to have an unpredictable preference for /θ/ replacement. Thus, the CAH appears to lack the explanatory power to motivate why one transfers and the other does not. For example, Spanish and Japanese L1s replace English /θ/ with [s]. Thai speakers, on the other hand, replace English /θ/ with [t] and never with [s], exhibiting
the reverse observed in Spanish and Japanese L1s. Since the CAH appears to be ill-equipped to handle this variation, Lado proposes some explanations based on ad hoc assumption, e.g. speakers of peninsular Spanish often hear /θ/ replaced by [s] from speakers of the coastal regions of southern Spain when communicating in the L1. The replacement pattern for Thai speakers was motivated by claiming ‘th’ was more structurally similar to ‘t’ than ‘s’ in the graphemic sense.

In summarizing Fries and Lado it must be recognized that the CAH is capable of generating accurate assumptions about negative transfer. However, when contending with less overt cases of L1 influence such as coda cluster simplification or segmental substitution criteria, the CAH appears to be lacking in explanatory power at least in its original manifestation. Despite its shortcomings, the CAH model, or versions thereof, is popular with researchers because it is highly falsifiable. The biggest difference in contemporary studies from those carried out in the past rests in how the results from the former are analyzed. Predictions are still made about L2 production based on the structure of the L1, but researchers are aware that other factors also play a role in the inaccuracies of L2 production.

As language researchers began to investigate the influence of the L1 on the L2 through utilization of contrastive analysis methodology, it became obvious that the CAH could not account for some of the observed phenomena in their results. As a response to this potential weakness, proposals began to emerge whose purpose was to rectify the hypothesis’ original claims.

In Wardhaugh (1970), for example, it was proposed that researchers should adopt a weak version of the CAH which still performed L1 and L2 analysis but eradicated hypothesis development. In this view, analyses would be proposed after experimentation had taken place so
researchers could not be held responsible for predicting inaccuracies. The main difference between the original CAH and this version was the fact that the latter suggested conducting language experimentation, whereas in the original version of the CAH experimentation was not mandated. The elimination of hypotheses generation in the weak proposal was unpopular because it threatened the CAH’s falsifiable nature. The solution has been to apply both models by generating hypotheses based on available language data, followed by analyses based on experimental testing.

Some of the early criticism of the CAH was directed at the predictability dimension of the framework (e.g. Briere, 1964; Nemser, 1961). Another component of the CAH that drew criticism was the absence of empirical testing to back up the initial claims. Although Lado appeals to practical experience as a language teacher, there is no empirical data to support much of what the CAH proposes. For example, we are told that native Spanish speakers replace English /θ/ with /s/ and that they are also most likely to produce intervocalic English /d/ as [ð]. However, no specific studies are cited and no numerical data is offered to support these observations. Similar criticisms were also leveled at other studies that followed similar methodologies (e.g. Stockwell & Bowen, 1965).

One of the earliest attempts at empirically testing the predictive powers of the CAH was that of Briere (1961). In this study Briere tested how L1 speakers of American English would produce the sounds of an artificial composite language that included phonemes from French, Arabic and Vietnamese. Based on the comparative data, Briere developed a set of six predicted learning problems specifying selected differences between the L1 and the composite L2. These included differences in phoneme inventory, differences in allophonic distribution in the L1 and L2, as well as problems that might arise as a result of differences in syllable structure.
Participants were trained on how to produce the sounds of the L2 that were recoded and later judged by native speakers of the individual language. Briere’s results revealed that acquiring new L2 features, regrouping existing L1 features to correspond to segments of new L2 segments, and acquiring new sounds that are not present in the L1 presented the most difficulty to learners. Briere also found that learners seemed to be very consistent with producing sounds that were originally thought to be more challenging, e.g. accurately producing the /t/-/ð/ distinction when perception of this distinction was very difficult to detect. Briere also observed that learners preferred the production of /ɣ/ over that of /χ/; neither of which is found in the L1. In assessing these unexpected results, Briere argues that generating predictions on grammatical descriptions alone may paint an incomplete picture of actual L2 production. The study promotes the necessity of subjecting CAH predictions to empirical testing.

Another contribution that Briere made to the CAH is the integration of phonetic similarities and differences between languages in addition to the purely phonemic ones. In presenting the rationale for the study, Briere reasserted that by focusing only on phonemic differences researchers run the risk neglecting transferred phonetic material that has a significant effect on how the L2 is produced.

Another study that tests the reliability of predictions of the classical version of the CAH was Nemser (1971). In this investigation Nemser tests the production and perception of English stops and interdental fricatives by native speakers of Hungarian. The perceptual component was added to address the claims alluded to in Lado (1957) suggesting that inaccurate production was a product of inaccurate perception. The preliminary CA analysis predicted that Hungarian native

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6 It can be argued that Lado doesn’t necessarily make this claim, or at least he fails to elaborate on it. Although there is reference connecting perception to production, it doesn’t constitute a major concept within the CAH. Consensus
speakers would relate English stops to native Hungarian stops. The interdental fricatives /θ/ and /ð/ were predicted to be replaced by the native sibilants, apical stops or labial fricatives such as /ʃ/ and /ʋ/. Nemser’s results revealed that matching stop categories in the primary and target language resulted in minimal cases of inaccurate perception and production. In this sense the predictions of the CAH were highly accurate. On the other hand, the production of the interdental fricatives revealed slightly different results than were expected. For example, the voiceless interdental fricative was interpreted as /ʃ/ and the voiced counterpart was interpreted as /ʋ/ in the perception task. However, in the production task the interdental fricatives were produced with pre-fricative co-articulation, e.g. [fθ], [sθ]. What was most revealing about these data was their lack of predictability as neither language makes use of these complex segments. Nemser determined that the CAH, although accurate in some predictions, should be subjected to empirical testing, i.e. studies should include a parallel analysis and predictions followed by experimental data. The results also challenged the notion that learners who fail to produce a certain L2 sound should also exhibit inaccuracies in perceiving it. The data in Nemser indicate that learners are able to accurately discriminate between sounds while not always having the capacity to produce them at the same level of native exactness.

Nemser recognizes that although the L1 plays a significant role in shaping the L2 its interference is not the only factor contributing to foreign accent. Nemser suggested that the L2 grammar is unto itself a unique system independent of the L1 and L2. In offering a theoretical motive for the compound segments observed in the production tasks, Nemser suggests a tentative hypothesis of “elliptical perception” to account for phonetically blending separately stored

would argue that many disingenuous claims were made in Lado (1957), not all bold enough to warrant counterevidence.
lexical representations of *perceptual* and *productive* phonemes, e.g. /θ/ is stored perceptually as /θ/ and produced as /θ/ or as /θ/ at some point along the learning continuum.

Note that Nemser’s production results for the interdental fricatives reflect a divergence from the L1 in terms of articulatory differences, as opposed to distinctive features. In Lado’s original presentation of the CAH Nemser’s results would have been disregarded because the target language does not distinguish interdental phonemes based on pre-fricativization. Thus, as was proposed in Briere, Nemser too supports the notion of phonetic contrasting.

Studies conducted in the post CAH era generally set out to investigate what aspects of L2 speech production could be attributed to L1 transfer as opposed to *developmental factors*. Although transfer was a very clear notion, the concept of developmental factors was less intuitive because they were unable to be predicted based on L1 evidence. The definition of this concept is best understood through the observation of patterns in child first language acquisition. For instance, investigations of first language phonology have observed that children typically learn assimilation rules in less complex segments such as coronals before they are mastered in labials and velars (e.g. Macken & Ferguson, 1987). It has also been observed that children tend to acquire less articulatory complex segments before acquiring the more complex ones. For example Jakobson (1968) reports that stops are acquired before fricatives and that child speech will often substitute fricatives with stops.

Ingram (1976) addresses, amongst other phenomena, the phonological developmental processes in children in the acquisition of complex onsets and codas in English. For example, in /fricative + C/ onsets such as “stop”, the /s/ is typically deleted because it is generally thought to be a more complex sound than /t/, thus producing “top.” In /stop + liquid/ onsets as in “clock” and “bring” the liquid deletes yielding [ɡɔk] and [bɪŋ]. Two types of processes have been
observed in the case of complex codas. For example, in /nasal + voiceless stop/ codas the nasal is deleted, e.g. /bɔmp/ -> [bɔp], /tɛnt/ -> [det]. In nasal + voiced stop codas the voiced stop is deleted, e.g. /ɻɔwnd/ -> [dawn], /mɛnd/ -> [mɛn]. Although Ingram observed that children prefer to delete the marked segment of the onset, they also sometimes delete the unmarked segment, leaving the marked one intact.

Based on some of the data from L1 phonological acquisition in children, researchers began to ask if any parallels could be drawn with adult and child second language acquisition. These comparisons would disregard proven transfer effects by default because children do not come to the task of L1 acquisition from an L1 perspective. Parallels drawn between the two acquisition scenarios would be attributed to the interaction with language universals (Bach & Harms, 1968; Chomsky, 1965, 1972; Greenburg, 1963). At this point the major issue in L2 research was to discover whether L2 acquisition was similar in nature to L1 acquisition.

1.1 Interlanguage and transfer

One source which has contributed significantly to understanding L2 acquisition is found in Selinker (1972). In this work the author adheres strongly to the proposals of the Critical Period Hypothesis (Lenneberg, 1966; 1967: CPH) by upholding that the majority of learners beyond the stage of puberty exhibit latent psycholinguistic patterns in producing the target language. Such patterns are labeled as *fossilization* or *interlanguage*. Unlike the CAH, Selinker proposed that interlanguage is an independent *rule-governed* system of which transfer is a subcomponent, similar to the system children exhibit when acquiring the L1. To engage in analysis of learner production, Selinker argues for five central processes of which the structure of the mother tongue plays a less antagonistic role than in previous proposals. These are: 1) language transfer, 2)
transfer of training, 3) strategies of L2 learning, 4) strategies of L2 communication, and 5) overgeneralization of the target language.

One of the most significant contributions to the acquisition of L2 phonology in Selinker’s paper was the recognition of structures in oral production which could not be accounted for by the L1 or the L2. The researcher appeals to Haggard (1967) who argued that “alternative units” are available to learners during attempts to perform in the L2. Expanding on Haggard’s arguments, Selinker suggests that these “alternative units” are native to the latent psychological structure accessible during interlanguage. The suggestions made in Selinker (1972) were quite significant as they inspired L2 researchers to look at interlanguage as an independent rule-governed system. Soon, researchers would expand upon this notion to include the concept of Universal Grammar as playing a central role in L2 acquisition.

In setting out to discover whether a set of universal child L2 learning strategies exist Dulay et al. (1974) tested native Chinese and Spanish speaking children acquiring English as a second language. In their study 60 native Spanish speaking children and 55 native Chinese speaking children between the ages of six and eight years were selected to participate in the Bilingual Syntax Measure (BSM). In this data solicitation instrument children are shown pictures and are asked to respond orally to specific questions pertaining to their content, e.g. “Why is he so fat?” The children were graded on eleven functors in their responses: pronoun case, article the/a, progressive -ing, contractible copula (’s), plural (-s), contractible auxiliary (’s), past regular (-ed), past irregular, long plural (-es), possessive (’s), and 3rd person (-s).

The overall research interest associated with the testing procedure was to discover if there were any parallels or discrepancies in order of functor acquisition as a measure of L1 and age. If

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7 The recognition of these facts in Selinker does not comprise part of the learning processes but is included in a separate section addressing anomalies in L2 production.
universal language learning strategies existed, then very few discrepancies should emerge in the data. On the other hand, if L1 transfer were the only factor in L2 acquisition, then L2 production should reflect major discrepancies in order of acquisition in participant production.

The results revealed a significant tendency for a universal order of acquisition irrespective of the L1. For example, Spanish plurals, for the most part, are formed as they are in English, yet native Spanish speaking children did not acquire them until after certain other functors, on par with their Chinese L1 counterparts. The researchers proposed a concept of “creative construction” where the processing of natural speech input is thought to be guided by universal principles that in turn project a specific order of acquisition.

Hecht & Mulford (1982) investigated the role of language universals and L1 transfer in the production of English fricatives and affricates by a native Icelandic speaking child. In their investigation the researchers took the stance of the CAH in stating that most of the problems in acquiring L2 segments would be the result of L1 transfer.

In formulating their investigation Hecht & Mulford compared the Developmental Position (DP) of L2 phonological acquisition against the Transfer Position (TP). In the DP, order of segment acquisition is predicted through segment difficulty and word position (e.g. voiced stops in coda position are more difficult than in onset position etc.). It was also proposed that in the DP, errors in the L2 acquisition process would be similar to those made by children in the process of L1 acquisition. The TP, on the other hand, predicted that the difficulty in acquiring L2 segments and word positions thereof will depend on how these structures exist comparatively in the L1, i.e. adherence to the CAH.

In their contrastive analysis of Icelandic and English the non-native fricative and affricates were /zʃʒθ/ and the similar phonemes were /f s v θ/. The participant in the study was a six
year old native Icelandic-speaking child who had arrived in the US ten weeks prior to the experiment. There were ten recording sessions which consisted of naturalistic conversation spread out over a period of 8 months. The results revealed that the easiest sounds in order of acquisition were: 1) /f/ and /s/ in all word positions, 2) initial /θ/, 3) initial /ð/, 4) /ʃ/ in all positions, and 5) medial /ð/. As far as determining the role of transfer and developmental processes it was found that exact segments from the L1 experienced the highest degree of accuracy throughout the study. Similar segments, i.e. those which differ from the L1 by way of minor phonetic differences or distribution were also produced with greater accuracy than entirely new sounds, though with less accuracy than identical sounds. The entirely new sounds were produced with the least accuracy for all sessions. To best highlight the role of language universals the participant’s erroneous productions were analyzed for phonological processes. These were: 1) devoicing ([f] for [v]), 2) looser closure ([ʃ] for [tʃ]), 3) tighter closure ([t] for [s]), 4) deletion ([fɪ] for [fɪʃ]), 5) palatalization ([ʃ] for [s]), 6) voicing ([z] for [s]), and 7) labialization ([b] for [d]). Of these processes the most common were word final devoicing and consonant strengthening in word initial position.

In the acquisition of novel affricates the participant exhibited more utilization of universal effects, e.g. [dʒ] -> [d], [tʃ] -> [t], [dʒ] -> [ʒ], [tʃ] -> [ʃ]. The final two examples of affricate weakening were less common. The researchers state that transfer effects and universal processes may work together in a developing phonology. This was made apparent in their assessment of word final /z/ devoicing; a process that could be interpreted as originating from L1 transfer or universals. Since the participant showed no improvement in voicing word final /s/, the researchers suggested that items that could be doubly affected by L1 transfer and universals may eventually be the hardest to acquire in the L2. Another observation was the difficulty that the
participant had in producing -\(\delta\)-, which is common in the native language. Under further scrutiny it was found that all inaccurate productions of /\(\delta\)/ in the L2 occurred before syllabic /\(t\)/ in words such as father and brother. In this case the researchers claimed that the participant sacrificed a well known sound in an attempt to produce a distinct one; /\(t\)/ was produced correctly even though it is not part of the L1 inventory. The researchers concluded that the TP was the best predictor of accuracy of affricate and fricatives in the L2 while the DP was the best predictor for sound substitutions with respect to difficult segments.

To better understand the relationship between the acquisition of phonological rules and temporal implementation in a second language, Port & Mitleb (1983) tested three different measures of native Arabic speakers learning English stops. The first measure was the VOT values of English /\(p\)/ and /\(t\)/ in word initial position which have significantly longer lag times than Arabic due to aspiration. The second measure was /\(p\)/, /\(b\)/, /\(d\)/, /\(t\)/ in word final position preceded by a vowel. The final measure was the length of the vowel before the word final stops. All test words were presented in the carrier sentence “He tried to say ______ again.”

The researchers were mainly interested in three different outcomes; 1) Acquisition of aspiration of voiceless stops in word initial position, 2) acquisition of the English flapping rule of word final stops /\(t\)/ and /\(d\)/ in the sentential context, and 3) lengthening of the vowel before a voiced stop or flap. Their results showed that even though the participants had studied and even taught English for many years, they has still not acquired the appropriate temporal patterns of the L2. For example, none of the participants exhibited aspiration in word initial position for the voiceless stops indicating that the coordination between the spread glottis and the anterior articulators had not been mastered. As far as the phonological rule for flapping word final /\(d\)/ and /\(t\)/ the data showed that it had been acquired for all participants. However, although the
phonology of flapping was present, its temporal implementation showed inconsistencies as the preceding vowel failed to exhibit any length variation between voiced and voiceless stops. The preceding vowel was expected to show significant changes in duration depending on the voicing of the following segment. The vowel should have had the shortest duration before voiceless stops, a longer duration before voiced stops and the longest duration should have been attested before the flap. Port & Mitleb concluded the most probable cause of accent in the L2 isn’t so much the acquisition of L2 phonological rules, but the acquisition of the implementation rules.

The results of Port & Mitleb pertaining to aspiration are similar to those of Hecht & Mulford (1982) because the transfer position here is also the universally favored one, i.e. short lag voiceless stops are less marked than long lag voiceless stops. This could account for the reason the Arabic L1s have not acquired the English pattern even after many years of study and residence in an English speaking country.

1.2 Markedness

As the concept of universals began to share the stage with L1 transfer in the L2 acquisition literature, studies began to integrate the concept of “markedness.” As outlined in Hume (2011) markedness is typically described in phonology in one of three different ways; 1) descriptive markedness, 2) theoretical markedness, and 3) markedness constraints. Of these concepts the one which is most commonly referred to is descriptive markedness, which classifies items as being marked or unmarked. *Theoretical markedness* refers to the the universal principle that guides languages toward unmarked forms and *Markedness constraints* refers to the component of Optimality Theory (Prince & Smolensky, 1993) that expresses well-formedness of output forms. The original idea of Markedness was presented in Trubetzkoy (1939) in referring to specific
sounds that differ from other sounds because they were marked with a specific feature. Thus, /b/ and /m/ are both labial but /m/ has the extra feature [nasal] and thus it is considered as marked. Contemporary utilization of the concept is to describe certain sounds as containing a certain property descriptor which either classifies the item as marked or unmarked. The unmarked and marked descriptors of Hume are described in (2) (Hume, 2011:80).

(2) Markedness descriptors

<table>
<thead>
<tr>
<th>Unmarked</th>
<th>Marked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural</td>
<td>Less natural</td>
</tr>
<tr>
<td>Normal</td>
<td>Less normal</td>
</tr>
<tr>
<td>General</td>
<td>Specialized</td>
</tr>
<tr>
<td>Simple</td>
<td>Complex</td>
</tr>
<tr>
<td>Inactive</td>
<td>Active</td>
</tr>
<tr>
<td>More frequent</td>
<td>Less frequent</td>
</tr>
<tr>
<td>Optimal</td>
<td>Less optimal</td>
</tr>
<tr>
<td>Predictable</td>
<td>Unpredictable</td>
</tr>
<tr>
<td>Acquired early</td>
<td>Acquired later</td>
</tr>
<tr>
<td>More phonetically variable</td>
<td>Less phonetically variable</td>
</tr>
<tr>
<td>Articulatorily simple</td>
<td>Articulatorily difficult</td>
</tr>
<tr>
<td>Perceptually strong</td>
<td>Perceptually weak</td>
</tr>
<tr>
<td>Perceptually weak</td>
<td>Perceptually strong</td>
</tr>
<tr>
<td>Universal</td>
<td>Language specific</td>
</tr>
<tr>
<td>Ubiquitous</td>
<td>Parochial</td>
</tr>
</tbody>
</table>

One of the most controversial topics associated with markedness in phonology is how to establish criteria on which to determine if phenomena are marked or unmarked. Hume provides a list on which researchers have based the prediction of markedness patterns.

(3) Prediction of markedness patterns

a. Acquisition
b. Phonological patterns
c. Phonetics
The standard for using the pattern of *acquisition* for determining markedness is based on the order of child L2 learning. For example, the sounds that children learn to master first represent the unmarked patterns while the later acquired sounds are more marked (e.g. Jakobson, 1971). Although Hume emphasizes that markedness in acquisition should not be taken as an absolute and evidence exists to the contrary, the overall order of acquisition typically reflects an unmarked to marked development continuum.

*Phonological patterns* such as deletion, reduction, and assimilation are thought to be guided by markedness in many ways and thus may be insightful indicators. Items that are marked, on the other hand, will typically resist being subject to modification. As an example Hume highlights that coronals are typically more likely to undergo change through place assimilation to the following consonant when compared to dorsals, which undergo fewer assimilatory processes. Since dorsals are generally resistant to change they can be classified as more marked than coronals.

In using *phonetics* as a predictor of markedness Hume explains that phonetic variability, articulatory simplicity, and perceptual distinctiveness can serve as reliable indicators. For example, Hume cites Trubetzkoy (1939), Greenburg (1966) and Rice (1999) in asserting that segments with a high number of allophones can be considered as “unmarked” while segments which resist change are “marked.” Articulatory factors in phonetics play an important role in predicting markedness as well. Unmarked items are considered to be less articulatorily complex than their marked counterparts. For example, /θ/ and /ð/ require more control and coordination over the articulators than any other sound (Calabrese, 1995: as cited in Hume 2011:94). Since
sound sequences require more articulatory adjustment, they are generally considered more marked than single segments. Another predictor of markedness within the phonetics category is that of *perceptual distinction*. For instance, sounds that cause the most significant change in the speech signal are said to stand out and be *distinctive*. Because of their integrity and high perceptual salience, such sounds are classified as being less modifiable and more marked. Sounds that emit weak perceptual distinctiveness, on the other hand, are considered to be less marked and more susceptible to phonetic or phonological change.

The *usage* category which refers to the frequency of a specific item, states that the more frequent the item is, the less marked it is thought to be. Hume cites Paradis & Prunet (1991)’s analysis of coronals in detailing that frequency can be assessed in terms of; *inventory frequency*, e.g. high number of coronals in a given consonant inventory, *typological frequency*, e.g. number of coronals in a universal phonemic inventory, and *occurrence frequency*, e.g. the number of times coronals are produced in a given speech corpus.

The final pattern mentioned by Hume in determining markedness is that of *Cognitive Factors* which is based on the *entropy and information content model* closely associated with computational linguistics. The entropy model is concerned with making predictions on the basis of the information available to the system in terms of binary data. As applied to phonology the system is used to help determine how many binary features are necessary to distinguish one sound from another (e.g. Cherry at el. 1953 as cited in Hume: 98). Sounds with the most features were marked and those with the least features were unmarked. Any sounds or sound clusters that would add extra entropy are considered as contributing to the complexity of the system and thus to the system’s degree of markedness.
Hume provides an example of entropy in the name of the Polish city Gdansk. When produced by native English speakers an epenthetic [ɔ] is inserted between the /g/ and the /d/ of the word-initial cluster. According to Hume the motive for epenthesis, as well as the reason for selecting the particular epenthetic vowel, can be predicted by the entropy model. It is thought that by adding [gd] to the English system one contributes to raising its level of complexity based on probability statistics of [gd] versus [gəd] sequences in English phonotactics. Referring to previous data, Hume states that the probability of [gd] in English is zero and that adding it to the system only increases the system’s level of entropy. However, since [gəd] already exists within the system, the level of entropy is mostly unaltered. Hume then explains that the same reasoning can be used to predict why the epenthetic vowel [ɔ] is selected as opposed to [a], [o] or [e] etc. Since [ɔ] has high frequency and has a minimal degree of markedness in terms of positive feature specifications, its contribution of minimal entropy to the system qualifies it as the best candidate.

1.3 The Markedness Differential Hypothesis (MDH)

Although the specifications listed above are not without their critics and contradictions, they do serve as useful reference points in making decisions about markedness cross-linguistically or as related to individual phonological systems. In determining markedness in language it is essential to interpret the concept as relative and open to contradictory observations rather than viewing it as absolute.

Examining the notion of language universals and their influence on second language acquisition Eckman (1977) proposed a redefining of the strong version of the CAH to include a universal component based on the concept of markedness. In developing his proposal, Eckman
observed that certain L2 phenomena could not be accounted for by the CAH. The case in point was 1) the acquisition of English voiced stops in coda position by German L1s, and 2) the acquisition of the French voiced palatal fricative in word initial position in English L1s. These target phenomena were selected because neither is present in the L1s of the participants; German devoices voiced coda stops and English does not have word initial /ʒ/. The problem with these data comes from the empirical observation that German L1s have a harder time acquiring English voiced codas than English L1s have at acquiring French /ʒ/ in word initial position. The CAH, at least in its original form, would not be able account for the asymmetry in acquisition between English and German L1s.

In addressing these learning difficulties, Eckman proposes the Markedness Differential Hypothesis (MDH) which formally introduces the role of markedness in L2 phonological acquisition. To fully understand Eckman’s proposal markedness must be viewed in implicational terms. That is, if a language possesses a marked form it may imply the presence of similar less marked forms. For example, CV is the least marked syllable structure of the worlds’ languages. The presence of CV does not imply the presence of CVC. However, the presence of CVC does imply the presence CV. The same can be said of voiced stops, which are considered more marked than voiceless stops due to complexity of articulator coordination. If a language has voiced stops, then voiceless stops can be implied. However, the opposite is not true, (e.g. Korean).

The MDH proposes generating predictions in the L2 by explicitly counting for markedness through the following claims as outlined in Eckman (1977).

(4) Markedness Differential Hypothesis
1) Those areas of the target language which differ from the native language and are more marked than the native language will be difficult.

2) The relative degree of difficulty of the areas of the target language which are more marked than the native language will correspond to the relative degree of markedness.

3) Those areas of the target language which are different from the native language, but are not more marked than the native language will not be difficult.

The difficulty German L1s experience in acquiring the voiced stop codas of English corresponds to the second claim of the MDH. That is, voiced stops unto themselves are not marked in German as long as they occur in onset position. The “relative degree of markedness,” is increased when voiced stops occur in the coda because it is typologically less common for voiced stops to appear in this position. Also, because the coda position is one of neutrality, it is more appropriate for less structurally marked segments to occur there, e.g. voiceless stops. Claim 3) of the MDH provides motivation for the facility in which English L1s acquire French /ʒ/ in word initial position. Although English has no word initial /ʒ/ it is relatively easy for native speakers to acquire it because it does have /ʒ/ in word final position, which is structurally more marked than word initial position.

Eckman (1984) investigated the production of word final voiced stops by Japanese and Mandarin L1 learners of English. Neither of these languages have obstruents in coda position so inaccurate productions in the L2 cannot be attributed to the respective L1s. The data revealed that these participants utilized word final vowel epenthesis, e.g. /lɔv/ -> [lɔvə], /bæd/ -> [bædə], /tæg/ -> [tægə]. Since no known human language utilizes vowel epenthesis in word final position (e.g. Sanders, 1979) the data reveal that the markedness associated with voiced codas is active in IL grammar, thus motivating the repair. Eckman makes the assumption that learners acquire the voiced obstruent in coda position simultaneously with the repair strategy. Since German speakers, unlike Japanese and Chinese speakers, exhibit the L1 pattern of devoicing stop codas in
the L2, the presence of L1 grammars in the L2 is apparent, i.e., they are not completely autonomous.

In a study designed to test whether interlanguage shows evidence of independently adhering to typological universals, Eckman (1991) examined consonant clusters in coda and onset positions in the English of native Japanese and Cantonese L1s. More specifically, the researcher tested whether the Fricative-Stop Principle and the Resolvability Principle (Greenberg, 1978) were active in interlanguage production. The Fricative-stop Principle states that if a language has a stop + stop sequence, e.g. /æpt/ (apt), it also has a fricative + stop sequence /lIst/ (list). The Resolvability Principle upholds that consonant clusters of x length imply consonant clusters of at least x-1 within the same occurring contexts, e.g. the presence of /CCC/ onsets implies /CC/ (x-1) and /C/ (x-2) onsets. An example of the Resolvability Principle is seen in English words such as string, sting, try, where the triple consonantal onset implies double onsets in both combinatory possibilities. In Eckman’s study it was hypothesized that if learner production operates as an independent system, then these principles, which are active in L1 acquisition, should be adhered to in interlanguage. Since neither Japanese nor Chinese have consonantal clusters in onset or coda position, the selection of these languages were thought to be ideal to minimize noise from transfer effects.

Before carrying out the experimentation Eckman proposed four possible cases of potential outcomes labeled as: strong, weak, consistent and counter versions of the hypothesis. In the strong form all predicted outcomes occur, i.e. C1C2C3 (string) -> C1C2 (sting) / C2C3 (treat). In the weak form C1C2C3 occurs but either C1C2 or C2C3 is missing, e.g. acquisition of string, try but not treat or acquisition of string, treat, but not sting. The options which were consistent with the hypothesis resulted in forms where the following occurred: 1) C1C2 and C2C3, 2) C2C3
alone, 3) C1C2 alone 4) none. The only case that exhibited counter evidence to the hypothesis is that in which C1C2C3 is evidenced without the presence of C1C2 or C2C3. Since *consistency* to the hypotheses offered the greatest number of possibilities, Eckman predicted the results to follow this trend.

As had been predicted, *consistency* was the widest attested case of hypothesis adherence, receiving 324 out of the total 524 possibilities, i.e. there were 524 total items with onset clusters of two segments that were potential candidates for the resolvability principle. This was followed by the strong version of the hypothesis with 147 cases, and then the weak version with 48 cases. There were only 5 cases where the hypothesis was rejected. In light of these data Eckman concludes that interlanguages merit further investigation as to whether they should be considered as independent language systems.

In discussing the final results of this study Eckman acknowledges that the MDH could not have predicted the outcome because the study was not designed to test implicational universals based on the L1. The MDH stated that English speakers could easily acquire French word initial /ʒ/ because the L1 already had this sound, albeit in a less universally marked position. In Eckman (1991) effects of implicational markedness were observed, but in the context of the L2. In light of this observation Eckman proposes the Interlanguage Structural Conformity Hypothesis (ISCH):

(5) **Interlanguage Structural Conformity Hypothesis**

The universal generalizations that hold for the primary language also hold for interlanguages.
Further investigation utilizing the SCH was carried out in Eckman & Iverson (1994) as well as in Carlisle (1997). The first of these studies examined the acquisition of English voiced codas consisting of simple obstruents by native Japanese, Cantonese and Korean speakers. Although Korean and Cantonese both have obstruent codas it was predicted by the SCH that coda consonants would be challenging to acquire regardless of the L1. This was thought to be the case because the SCH upholds that interlanguages, irrespective of the structure of the L1, adhere to markedness. The results revealed that errors were significantly correlated with the degree of markedness of the coda obstruent, even when they occurred in the same environment in the L1. It is also interesting to note that even though Korean does not have glides in coda position, the Korean L1 participants performed extremely well in producing them. Although these results were representative of the SCH, it is important to mention that L1 structure remains a significant factor in L2 acquisition as their participants performed best on those items present in the native language, e.g. Korean speakers performed best on nasal and voiceless stop codas. Adherence to L1 structure was even more evident in the Cantonese data whose results revealed a high error rate in the production of liquids in coda position. According to the SCH these should have been amongst the easiest to acquire due to their relative lack of markedness. Because of the strong prohibition of liquids in coda position in the L1, it was concluded that their performance was an effect of transfer.

In Carlisle (1997) the SCH was tested on Spanish L1s acquiring /sC/ and /sCC/ word initial clusters in English. Since native Spanish speakers repair these clusters through epenthesis of /E/, e.g. /sku:l/ (school) -> [Es.ku:l] (eschool), /spæj/ (spray) -> [Es.prej] (espray), the phenomena was considered to be an example of direct L1 transfer. However, Carlisle implicated the SCH by predicting that typological universals still played a role in the data by exhibiting more instances
of repair in the more marked of the two clusters, i.e. /sCC/. The study also hypothesized that the segment preceding the cluster would also play a major role in accurate syllable production. More specifically, a preceding consonant in connected speech was considered the most marked context while a proceeding vowel represented the unmarked context. Carlisle’s results indicated that there were significant effects for both cluster length and context. Before shorter clusters following consonants, e.g. /najt # sku:l/, there was more epenthesis, but before longer clusters preceded by vowels there was less, e.g. /badi # sprej/ -* [badi # esprej]. The argument against the presence of the epenthetic vowel in the second type is based on Spanish resyllabification. In /najt # sku:l/ (CVGC.CCV:C) there is no vocalic element before the /sC/ cluster to generate resyllabification, and thus, /e/ is inserted resulting in /s/ in coda position, e.g. CVG.CVC.CV:C. In /badi # sprej/ resyllabification repairs the illicit onset structure without having to appeal to vowel epenthesis, e.g. CV.CV.CCVG -> CV.CVC.CVG. The observations of this study are significant because they reveal that although the epenthetic segment is the result of L1 transfer it appears to be mediated to a certain degree by markedness.

In a study that tested the acquisition of complex onsets Hancin-Bhatt & Bhatt (1998) showed how transfer as well as language universals play a role in acquiring these constructs. The participants consisted of Japanese and Spanish L1s whose task was to produce complex onsets. In terms of the role of transfer, it was hypothesized that Spanish speakers would perform better at Consonant + liquid onsets than the Japanese speakers because of positive L1 transfer. In terms of universals, however, both groups were hypothesized to adhere to the Minimal Sonority Distance parameter setting (Broselow & Finer, 1991), which states that the farther apart the two members of the onset are in terms of sonority distance, the easier they will be to acquire, i.e.
assuming the onset is of rising sonority. Their results revealed that both transfer and Universal play a role in L2 acquisition as the native Spanish speaking participants out performed the native Japanese L1s in the production stop + liquid onsets, e.g. *br, cr, dr* etc. Hancin-Bhatt & Bhatt showed that accurate predictions can be made about L2 acquisition based on positive transfer and the expected outcomes of universal language constraints.

1.4 Phonological frameworks

In order to provide a representation of the sounds and processes involved in the present study two theoretical phonological frameworks were selected; Feature Geometry (Clements, 1985; Clements & Hume, 1995; Halle, 1992, 1993) and Articulatory Phonology (e.g. Broman & Goldstein, 1989: ‘AP’). The utility of the theoretical framework is for expository purposes only and not to propose an argument for a specific one or version thereof.

1.4.1 Feature Geometry

In Feature Geometry the categorical representation of sounds is carried out by arranging distinctive features into nodal hierarchies. For example the place features are arranged under the Place node. Following Clements & Hume (1995), the node that is at the top of the hierarchical structure is the root node followed by the laryngeal and Oral Cavity nodes. The Laryngeal node represents the state of the glottis which controls phenomena such as voicing. The oral cavity node covers everything beyond the glottis including place of constriction. A representation of the nodes is given in (6) below.

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8 Hancin-Bhatt & Bhatt also examined the effects of transfer and universals on complex codas of falling sonority and found that both language groups adhered to the Minimal Sonority Distance Parameter as hypothesized as these languages do not possess complex codas.
Distinctive features are placed into the feature tree to represent specific sounds. For example, for a sonorant, the [voice] feature would be placed under the laryngeal node etc. A feature geometric representation of /t/, for example, is given in (7).

In (7) the laryngeal node received a [-voice] feature as /t/ is a voiceless sound. It also received a [spread] feature as the glottis spreads in the production of English /t/ which results in aspiration. Since /t/ is produced with the front part of the tongue the coronal (COR) C-place node receives a [anterior] ([ant]) feature. Since /t/ is a stop the oral cavity feature of [-continuous] ([-}
The features assigned to the root node /t/ describe that it is a consonant sound, [cons], but that it is not a sonorant [-sons] or a nasal [-nasal] sound.

Feature Geometric representations facilitate the description of minute changes between phonemes. For example, (7) would represent a /d/ just by changing the laryngeal specification to [voice] and [-spread]. By utilizing this type of organization of one can speak in hierarchical terms and note that it is a difference in the Laryngeal specification that distinguishes /t/ for /d/.

Although Feature Geometry provides a good framework for providing an analyzing the categorical differences between sounds, it is ill-equipped for illustrating the fine grain phonetic disparities. For example, there is no practical manner in which to represent the duration of the /t/ in (7) purely through the use of Feature Geometry lest it be done through the incorporation of two successive X slots. However, although this would indicate longer duration as a geminate /t/, the description remains a categorical one. A more indicative way of representing this is through the use of Articulatory Phonology.

### 1.4.2 Articulatory Phonology

One of the main advantages of AP for describing phonetic differences between sounds is the integration of the element of time and the dynamic interaction of features, which are represented in the form of gestures. In total, there are five gestures in AP: VEL (Velar), TB (Tongue Body), TT (Tongue Tip), LIPS, and GLO (Glottis). Each one of these gestures involves a tract variable describing the manner in which the gesture is executed. For example, for the sound /t/ the TT gesture touches the alveolar ridge so the tract variable is ‘Alveolar.’

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9 In Halle & Hume (1995) the root nodes are proposed as [sonorant], [approximant], [vocoid], and [nasal]. This proposal is modified slightly with the root nodes represented as [sonorant], [consonant], [nasal] for the sake of simplification.
The time element in AP is illustrated through the use of a ‘gestural score.’ For example, the
gestural score for /t/ is given Figure 1.1.

<table>
<thead>
<tr>
<th>VEL</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TB</td>
<td>Wide Pharyngeal</td>
<td>Wide Pharyngeal</td>
</tr>
<tr>
<td>TT</td>
<td>Clo Alveolar</td>
<td></td>
</tr>
<tr>
<td>LIPS</td>
<td>Spread</td>
<td></td>
</tr>
<tr>
<td>GLO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1.1 Gestural score for [at̚a]**

In Figure 1 the wide body of the tongue touches the Pharynx to produce the articulation.
This articulation is held for a particular amount of time then the tongue tip is raised to the
Alveolar ridge while the glottis is held in the spread position. These two gestures are then held
for a specific amount of time. Notice that the TT gesture is specified for Closure (Clo) which
means that the tongue makes complete contact with the passive articulator which is characteristic
for stop sounds. The alternative would be the specification of a “critical” value that is used for
representing air friction between the articulators characteristic of fricatives, and approximants.
The shift is then made back to the Tongue Body gesture to produce the /a/ again. This same
series of sounds is given with a spectrographic representation in Figure 2. in order to better
illustrate the interplay of the time variable with gestures.
In Figure 1.2 the variable of time becomes clearer with the incorporation of the spectrograph. The entire sequence of sounds lasts for 489 milliseconds with each individual gesture having its own specification for time. Notice that there is a slight aspiration upon the release of the TT gesture. This aspiration is easily captured in AP as gestural coordination. The GLO gesture is held in the spread position after the TT has been released thus accounting for the brief puff of air that is pointed out with arrows.

The present study will use Feature Geometry to represent categorical phenomena and AP to represent phonetic differences that cannot be completely motivated by a categorical framework.
1.5 Summary

The purpose of the present chapter has been to provide a broad overview of some of the approaches to second language phonological acquisition and to exhibit the role of the CAH as a relevant contemporary framework. It has also presented the descriptive theoretical framework chosen to represent the target items of the study.

As we have seen from the studies covered, a major tendency in the research has been to classify which factors are products of transfer and which can be traced to developmental phenomena such as markedness. In these investigations a common methodology is to highlight a specific segment or phonological rule and draw a contrast between the L1 and the L2. As emphasized in Major (2008), the modified form of the CAH is still very prevalent in contemporary studies where tentative hypotheses are proposed and empirical tests are then conducted. As noted in Gass & Selinker (1992) the CAH is the ideal model for initiating studies of L2 acquisition, but research must go beyond the stage of hypothesis formulation and explore the multifaceted nature of interlanguage.

The present study emulates the CAH in the sense that it provides a contrastive analysis between the L1 and the L2 and formulates hypotheses thereof. However, since it is undeniable that other factors play a role in L2 acquisition that cannot be predicted based on the L1 evidence alone, the study also adapts the methodology of post CAH studies in performing an empirical analysis designed to confirm or reject claims of positive and negative L1 transfer. Theoretical proposals beyond L1 transfer will be presented with respect to those characteristics of the IL that cannot be traced to the L1 or the L2.
Chapter 2

2. Previous studies on EGS

The purpose of this chapter is to highlight the most important studies conducted to date on EGS. These are Granda (1985), Lipski (1985) and Quilis and Casado-Fresnillo (1995). There have been other treatments of EGS prior to 1985, e.g. Gonzalez Echegaray (1951, 1959), Castillo Barril (1964, 1969). However, the level of description in these studies are better suited for serving broader cultural interests rather than for linguistic inquiry.

Although groundbreaking in many ways, the studies mentioned in this section do have some shortcomings which sometimes frustrate the interpretation of their findings. For example, in Granda there is very little information given about how the data for the L1 was gathered and subsequently analyzed. The reported results are not accompanied by any statistical analysis and many details on both phonetic and phonological information are excluded. The results in Lipski fail to exhibit the expected surface variation reported in other studies, especially taking into account the culturally diverse pool of participants utilized. The reporting methodology of the phonetic and phonological information is extremely succinct with special attention paid to only few dialect characteristics. Also, some of the data reported about the native languages is inaccurate, e.g. that none possess palatal nasals and that Fang does not have CVC syllable constructs when it is actually one of the most common syllable types in the language. Although Quilis & Casado-Fresnillo (1995) accounts for the most thorough treatment of EGS to date, they still leave several questions unanswered, especially when it comes to tracing surface output to a particular L1. In fact, at the time of their study only two of the four native languages spoken by
their participants had received any grammatical description, i.e. Fang and Bubi. Thus, when certain phenomena occurred that could not be attributed to these particular L1s, they were either motivated as independent, or as characteristic of the other L1s besides Fang and Bubi.

2.1 Granda (1985)

Inspired by work carried out by Greenberg & Berry (1966) and Bal (1979) who were interested in documenting the effects that native African languages had on the European languages of several African countries, Granda expressed the need to apply a contrastive methodology to the Spanish of Equatorial Guinea as Spoken by native speakers of Fang. In covering similar types of linguistic investigation, Granda makes reference to four categories of Afro-Hispanic linguistic inquiry preceding his study. These are; 1) the phonetic interference of pidgins and creoles from Africa and the Americas on Spanish and Portuguese (e.g. Alleyne, 1980; Boretzky, 1983; Ferraz, 1979), 2) Interference of African languages on the Spanish and Portuguese of the Americas (e.g. Granda, 1977; Megenney, 1980; Valdes Bernal, 1978), 3) studies of black Spanish and Portuguese as documented in the literary works of both Spain and Portugal (e.g. Granda, 1978; Weber de Kurlat, 1962), and 4) Interference of native African languages on African Portuguese (e.g. Bal, 1969; de Morais Martins, 1958). In building the rationale for his study Granda notes that among these categories of inquiry no study had yet existed on the interference of native African languages on Spanish within the continent of Africa, partly because Equatorial Guinea was the only country in Africa – and still is – that uses Spanish as its official language.

The aim of Granda’s study was to investigate the phonetic characteristics of Fang that surface in the spoken production of EGS, limiting the inquiry to consonant segments. Because

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10 17 years later this situation has only minimally improved; the difference being Mdjo Mve’s treatment of Bata Fang.
Fang is the most widely used L1 in the country, Granda reckoned it to be the most influential on the spoken character of the L2. Granda explains that the Fang language almost holds exclusive status as the L1 in the interior region of the country known as Río Muni and that it was slowly becoming more and more exclusive on the island of Bioko (Formerly known as “Fernando Poo”) where the capital Malabo is located.

In describing the necessary material for building his contrast between the consonantal systems of Fang and Spanish, Granda acknowledged that the absence of comprehensive data on Fang phonetics and phonology posed a critical disadvantage. The descriptive studies that did exist were described by Granda as lacking sufficient detail to develop the kind of outline of the Fang phonological system that was needed for the proposed investigation. To fill this void Granda decided to conduct his own empirical study of Fang based on a series of questionnaires consisting of 500 questions designed to solicit phonetic information. Although the exact number of participants is not listed, Granda states that they were from various regions of the country, were comprised of both males and females, and were between the ages of 30 and 50 years. The content of the questionnaire is not shown in the study.

It can only be left to assumption that Granda did not record the participants because he mentions that recording equipment wasn’t available. Without recorded speech Granda must have relied on theoretical knowledge and repetitive participant input. It was not mentioned whether Granda was a fluent speaker of Fang or whether he used assistants in analyzing the potential complexities of the language. These methodological disadvantages must be considered in assessing Granda’s results.

11 Though Granda does not elaborate on the matter it is highly plausible that it was prohibited at the time to allow foreigners or other citizens to possess the tools of the journalistic trade such as voice or video recorders.
Table 1 lists the consonantal phonemes of Fang as a result of Granda’s inquiry. The standard IPA notation was replaced by uppercase letters as Granda felt it leaned itself to better standardization due to “imposiciones tipográficas (Granda: 83).”

<table>
<thead>
<tr>
<th></th>
<th>Labial</th>
<th>Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Labio-velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiceless stops</td>
<td>P</td>
<td>T</td>
<td>K</td>
<td></td>
<td>KP</td>
</tr>
<tr>
<td>Voiced stops</td>
<td>B</td>
<td>D</td>
<td>G</td>
<td></td>
<td>GB</td>
</tr>
<tr>
<td>Voiceless affricates</td>
<td></td>
<td>TS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voiced affricates</td>
<td></td>
<td>DZ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voiced fricatives</td>
<td>F</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voiceless fricatives</td>
<td>V</td>
<td>Z</td>
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<td></td>
<td></td>
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<tr>
<td>Flaps</td>
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<td>R</td>
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<tr>
<td>Laterals</td>
<td></td>
<td>L</td>
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</tr>
<tr>
<td>Nasals</td>
<td>M</td>
<td>N</td>
<td>Ñ</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Glides</td>
<td></td>
<td>J</td>
<td>W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.1 Fang consonant phoneme inventory (Granda, 1984)

Considering that Granda was not working with recorded data and lacked the proper linguistic resources on Fang, the consonant inventory in Table 1 is quite accurate when compared to contemporary analyses of Fang conducted later by native-speaking linguists (Bibang Oyee, 1990; Medjo Mvé, 1997). There is a total count of 22 consonants in Granda’s inventory compared to 20 in that of Medjo Mvé and 23 in Bibang Oyee. The major differences between these listings are given in Table 2 below.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+/p/</td>
<td>+/p/</td>
<td></td>
<td>-/p/</td>
</tr>
<tr>
<td>+/g/</td>
<td>+/g/</td>
<td></td>
<td>-/g/</td>
</tr>
<tr>
<td>-/ŋg/</td>
<td></td>
<td></td>
<td>+/ŋg/</td>
</tr>
<tr>
<td>-/ŋmgb/</td>
<td></td>
<td></td>
<td>+/ŋmgb/</td>
</tr>
</tbody>
</table>

Table 2.2 Difference between Fang consonantal inventories

The difference between Granda and the two other studies rests in his exclusion of the complex nasal segments. During Granda’s analysis these segments were most probably mistaken for spontaneous prenasalization rather than distinctive segments. Medjo Mvé, unlike Granda and Bibang Oyee, excludes /p/ and /g/ from the phonemic inventory as no words in the language begin with these sounds and /g/ is not distinctive with /k/, but allophonic. More emphasis will be given to the Fang consonantal inventory in the contrastive analysis in the following chapter.

In contrasting the Fang consonants with those of Standard Peninsular Spanish (SPS), Granda observes that Fang is lacking the following segments: /θ/, /ʎ/, /x/, and /r/. The segments which exist in the Fang inventory but are lacking in SPS are: /v/, /z/, /s/, /n/, /gb/, and /kp/. Granda notes that Fang /b d g/ are produced as very tense stops in all positions where allowed. However, it must be noted that if /g/ is an allophone of /k/ as asserted in Medjo Mvé, then what Granda was most probably observing was /k/ voicing or possible instances of /gC/ or /ŋg/. It is also mentioned in Granda that /b/ is produced implosively in the majority of occurrences. Bibang Oyee, however, states that implosion only occurs when /b/ is preceded by a nasal segment. With respect to word initial nasals Granda observes that they are fully syllabic in nature and do not serve as syllabic onsets. Although this is a true observation for nasal affixes in Fang which mark certain classes, complex segments such as /ŋg/ and /ŋmgb/ are considered single segment syllabic onsets as was noted in Ladefoged and Maddieson (1993) for other Bantu languages. The utilization of spectrographic analysis may have helped Granda to see that complex nasal onsets
in words such as /mbep/ “door” and /ngam/ “game” possess similar acoustic specifications for length in single stop onsets such as /b/ or /g/ in the same position. Nasal prefixes, on the other hand, are typically longer and are syllabic (Bibang-Oyee, 1990).

With respect to the velar consonants /g/ and /k/, Granda observes that they are in free variation with the allophones [ʔ], [kʰ], [gʰ], and [ʔʰ]. However, since /g/ has a very questionable status as a phoneme of Fang, Granda’s observation could most probably be reformulated by saying that [ʔ], [kʰ], [gʰ], and [ʔʰ] are allophones of /k/ and not /g/.

In describing the distribution phenomena of Fang, Granda only lists 4 basic observations: 1) the prohibition of falling diphthongs, 2) the absence of nasal neutralization in coda position, 3) the prohibition of voiced stop obstruents in coda position, 4) the deletion of /l/ in coda position. Although these observations are indeed attested in Fang, they represent only a small fraction of the distributional allophonic changes in the language.

Following the Fang analysis, Granda describes the methods for collecting the EGS data. In this experiment more than 100 male and female participants between the ages of 45 and 80 years were selected. The participants were representative of diverse social and economic backgrounds ranging from high-ranking government officials to day laborers originating from various regions of the country.

The comparative framework for analyzing the data was adapted from Weinreich (1953)’s Languages in Contact. In Granda’s application of Weinrich contrasts were drawn between: 1) substitution of non-L1 phonemes with L1 replacements, 2) substitution of L2 phonemes with L1 equivalents (positive transfer) or near L1 equivalents, and 3) differences in distribution, i.e. sounds are only allowed to occur in some positions or with certain phonotactic specifications in the L1.
The results of Granada’s analysis of the three categories are provided in Table 2.3.

<table>
<thead>
<tr>
<th>Category 1</th>
<th>Category 2</th>
<th>Category 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Replace /θ/ with /s/</td>
<td>1) nasal epenthesis before voiced stops /g/ -&gt; [ŋg]</td>
<td></td>
</tr>
<tr>
<td>2) Replace /ʎ/ with /j/</td>
<td>2) [e] -&gt; Ø /__ [NC]</td>
<td></td>
</tr>
<tr>
<td>3) Replace /ɾ/ with /l/</td>
<td>3) [g] -&gt; [w] / __ [V]</td>
<td>3) [ɾl s] -&gt; Ø / __ #</td>
</tr>
<tr>
<td>4) /s/- [s] (near)</td>
<td>4) [j w] -&gt; Ø / [e o a] __</td>
<td></td>
</tr>
<tr>
<td>5) /m n nŋ/ (exact)</td>
<td>5) [ɾ l s] -&gt; Ø /__ #</td>
<td></td>
</tr>
<tr>
<td>6) /k d g/ -&gt; [t d] (near)</td>
<td>7) /b/ -&gt; [ɓ] (near)</td>
<td></td>
</tr>
<tr>
<td>8) /ʃ/ -&gt; [ts] (near)</td>
<td>9) /k g/ -&gt; [kʰ ɡʰ] (near)</td>
<td></td>
</tr>
<tr>
<td>10) /d/ -&gt; [ɾ] (near)</td>
<td>11) /n/ -&gt; [l] (near)</td>
<td></td>
</tr>
<tr>
<td>14) /l/ -&gt; [n] &amp; /n/ -&gt; [l] (near)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.3 Summary of results for EGS from Granada (1984)

As demonstrated in Table 3, the category that exhibits the most significant degree of L1 interference is category 2, the substitution of L2 phones by exact or similar phones from the L1. It must be emphasized that Granada does not elaborate on the frequencies of these processes nor is there any information correlating each process to social standing or region. In Category 1 all of the substitutions can be traced to the phonetic inventory of the L1. However, since /ʎ/ and /j/ are both palatal sonorants, it is unclear why this substitution was not included in category 2 as well. The substitutions in category 2 can be divided into two subcategories; 1) exact replacements (positive transfer), 2) close L1 equivalents. Category 3 lists the effects of the allophonic distribution rules of the L1. It must be emphasized here that Granada does not investigate how native Fang speakers deal with phonological rules of the L2; only those of the L1 that may have affected how the L2 is produced.
In sum, Granda (1985) was a significant step forward in the exploration of EGS as a dialect of Spanish and its relationship to the L1. Granda represents the first of its kind as it attempts to define EGS from the perspective of the L1 and conducts a formal study of the L1 in doing so. However, due to the lack of reliable grammatical references of Fang as well as the lack of technical resources such as recording equipment, the L1 analysis is very brief and inaccurate in some instances, e.g. the failure to recognize complex nasals in the phonemic inventory. In deviating from the traditional contrastive analyses of the previous decades Granda did not hypothesize errors in the L2 based on the L1 analysis.

2.2 Lipski 1985

During approximately the same time that Granda was conducting his study, Lipski (1985) was also investigating Spanish as spoken in Equatorial Guinea. The difference between these two studies was that Lipski did not choose to approach EGS from the perspective of the L1 but as an independent dialect of Spanish as spoken by a variety of speakers of other native languages. Although Lipski was principally concerned with the phonetic features of EGS information on morphology and syntax is also covered.

In Lipski’s introduction a brief history of Equatorial Guinea is outlined along with its relationship to the Spanish language. One of the most significant sections of Lipski’s introduction is one which addresses the “lack of creolization in Guinean Spanish.” In this section Lipski argues for several reasons why Spanish has not “creolized” in Equatorial Guinea as has been the case with other romance languages in other African nations (e.g. Côte d’Ivoire, Morocco). Lipski goes on to list five possible reasons why Spanish has not undergone creolization: 1) Spanish is not learned as a native language by the entire population, 2) Spanish has always had to compete for lingua franca status among native languages as well as French and
English influences, 3) consistent strength and unity of ethnic groups, 4) efforts by the Spanish educational system to promote language standardization, 5) relatively late colonization. Although all five of these possibilities can be considered as possible contributors, Lipski states that the first one is the most significant since the informal domains, e.g. home, marketplace etc., tend to foster a colloquial ownership of the language which contributes most to the formation of “creolized” languages. It is relevant to mention here that a new monolingual generation of Equatorial Guineans is forming that is utilizing Spanish in the domains once reserved for the L1. In fact, this generation typically does not learn the L1 and often times cannot hold conversations in the home with older members of the family, e.g. uncles, grandparents etc. who are not fluent in Spanish.

Lipski’s study included 25 participants and a variety of recorded radio speech. Data was collected utilizing both overt and secretive methods. Since it was assumed that formal interview contexts would solicit guarded speech, Lipski conducted some recordings surreptitiously. In total there were at least 12.5 hours of recorded speech and 25 hours of radio recordings resulting in a total spoken corpus of 40.5 hours. The L1 specifications of the radio data were not given.

If EGS is to be considered a dialect of Spanish proper, as opposed to an L2, one would expect a relatively uniform production across the native cultures and L1s within the country. Though not presented as protagonist, this is one of the most important questions that Lipski’s study addresses since the participant base represents nine different linguistic backgrounds: Bubi, Fang, Annobonese, Combe, Hausa, Fernandino, Benga, Sao Tomense, and Bujeba. Of these nine groups there were 10 native Bubi speakers (Bantu A.30), 4 Annobonese speakers (Portuguese-based creole), 4 Fang speakers (Bantu A.70), 1 Combe speaker (Bantu A.30), 1 Hausa speaker

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12 There would have been no way of knowing the L1 of the radio broadcasters.
(Afro-Asiatic A.1), 1 Fernandino speaker (English-based, A.K.A. “Pidginglis” or “Pichi”), 2 Sao Tomense speakers (Portuguese-based creole), 1 Benga speaker (Bantu A.30), and 1 Bujeba speaker (Bantu A.80 AKA “Kwasio”).

With respect to the claim of standardization Lipski states that one cannot detect if speakers in his data belong to distinct cultural and linguistic groups by listening to their spoken production. This is a potentially contentious observation since almost all of the L1s in the study belong to distinct language groups. This would also indicate that no transfer effects are present in the L2 and thus all obvious errors are characteristic of a regionalized dialect of Equatorial Guinean Spanish.

The theoretical framework utilized in the study was based on the conventions of generative phonology (Chomsky & Halle, 1968) in the sense that the researcher made reference to underlying and surface forms and other terminology and concepts related to SPE style phonology. It did not seem to be Lipski’s motive to generate rules of the SPE variety, though some are used in the study.

2.2.1 Vowels and diphthongs

In describing the production of vowels in his results Lipski notes that there is a great amount of articulatory instability that “escapes description through any systematic means.” Additionally, this vocalic instability is not associated with any particular social group and is said to be active within the idiolects of each speaker, i.e. speakers often produce the same word with distinct pronunciations upon each repeat. Due to this vocalic instability Lipski observes that the indicative is sometimes confused with the subjunctive, e.g. hable (subj) instead of habla and entienda (subj.) instead of entiende. However, this is never the case for irregular verbs, e.g. never
diga (subj.) for dice. Lipski states that these and other effects are observed in both stressed and unstressed vowels and that the output patterns defy “description by means of any coherent quantitative model (Lipski: 30).”

As far as diphthongs are concerned, Lipski states that their rarity in the L1 accounts for their inaccurate production in Spanish. He goes on to mention that falling diphthongs exhibit more inaccuracy than rising diphthongs and that most of the L1s in his study do not have falling diphthongs.

2.2.3 Consonants

In contrast to Granda (1985), Lipski did not find as many consonant deviations from the standard dialect of Spanish except in a few cases. For example, the dental /t/ and /d/ of Spanish were produced in Lipski’s EGS data as alveolars. This is indeed an unexpected observation since the majority of the speakers were Bubi L1s whose corresponding /d/ and /t/ segments are also produced dentally (Bolekia Boleká, 1991). The voiced stops /b d g/ were all reported as exhibiting an exceptional resistance to spirantization in all contexts and generally maintained their articulatory integrity in EGS. However, in the case of absolute word final /d/ Lipski notes that some variation is apparent between /d/ and the zero phoneme /Ø/; word final /d/ was not reported as showing any degree of frication, e.g [θ] or [ð] as is common in standard Spanish varieties.

One surprising observation in Lipski’s data was the accurate production of the voiceless palatal Spanish affricate /tʃ/. In Granda, this sound was reported as being substituted by the
alveolar affricate /ts/ of Fang as a result of equivalence classification\(^\text{13}\). According to Bolekia Boleká, the Bubi consonantal inventory has no affricate obstruents, thus the Spanish /tʃ/ represents an entirely new category for Bubi L1s. Although there is not much literature available on the matter, the Spanish affricate may also pose a challenge for speakers of the Portuguese-based creoles. In Flege (1987) it was observed that speakers were more apt to acquire sounds that are saliently different from those in the L1 with more native-like accuracy than those which are similar to L1 segments. At least in the data of the Bubi speakers, this would seem to be the case. However, since there is no phonetic evidence on these particular segments it is difficult to draw assumptions about the nature of the output.

In the sonorant category Lipski also noticed a great deal of segmental integrity. Although it was reported that the alveolar nasal typically exhibited native-like articulation, Lipski makes two interesting observations in the data. The first one is that word final /n/ never neutralized to a velar [ŋ] as is common in some southern peninsular and Caribbean dialects of Spanish. Perhaps the more interesting observation, however, is the lack of progressive nasal place assimilation to adjacent consonants at word boundaries, e.g. /son # be.sos/ -> *[som.be.sos]. Lipski suggests that since Equatorial Guineans are very self-conscious about appearing to be well-educated users of the language, there is a certain degree of slowness that preserves articulatory integrity at these junctures. In more recent studies (e.g. Cebrian, 2000) it was observed that L2 speakers tend not to transfer the timing patterns of the L1 in these contexts as part of a word integrity effect. Again, this issue requires further attention and more information about the word boundary phonology of the L1; a topic which will be addressed in the following chapter.

\(^{13}\) It is important to clarify that Granda (1985) did not use the terminology “Equivalence Classification.” It was simply the concept that was mentioned in the second category of his error classification system.
The final general observations in Lipski draw attention to the alteration of intervocalic palatal nasals. In few cases it was observed that /ɲ/ in deletion contexts such as /seɲor/ -> [seʃor] or [səør] is elided completely leaving a trace of the open velum through nasalization of the preceding vowel /e/. Lipski asserts that a possible motivation for this variation is because none of the native languages had the palatal nasal in its phonemic inventory (Lipski:40). However, the palatal nasal is listed as part of the Fang phonemic inventory as noted in both Bibang Oyee and Medjo Mvé.

In summarizing Lipski’s observations on EGS it is apparent that the results from his data were less variable than those of Granda. For the exception of a few consonantal variations, the EGS spoken by the eclectic field of participants in Lipski’s study was very reflective of the standard peninsula variety of Spanish. This observation implies the existence of a regionally unified Equatorial Guinean dialect of Spanish passed on from generation to generation. However, as Lipski assures (e.g. Lipski, 1985, 2008), Spanish in Equatorial Guinea still has a “superficial quality” about it that is more reflective of the L2 classroom than as a regionalized dialect of Spanish such as one would find throughout the Caribbean, Central or South America. Lipski emphasizes that EGS is simply missing those qualities associated with indigenized Spanish dialects such as /l/-/ɾ/ neutralization, nasal velarization in word final position, and /s/ aspiration in coda position etc.

2.3 Quilis & Casado-Fresnillo (1995)

In what is considered one of the most comprehensive studies of EGS, Quilis & Casado-Fresnillo (1995: ‘QCF’) provide an analysis of the phonology and phonetics of the dialect that covers more in depth descriptions of each segment than any of the previous investigations. Like Lipski, QCF’s approach does not originate from the perspective of the L1 but does take the L1(s)
into consideration when motivating certain phenomena. Thus, it is not a contrastive analysis study in the formal sense and no hypotheses are generated.

The participants in QCF were comprised of Fang, Bubi, Kombe, and Annobonese L1s with the majority being Fang and Bubi. Although QCF does not report statistical information for every analysis, they do make an effort to provide detailed observations of the phonetics as well as spectrographic evidence when necessary.

### 2.3.1 Vowels

An acoustic analyses was conducted on EGS vowels for each L1 group; Fang, Bubi, Annobonese, and Kombe. The general observations are given below. The analysis on the Fang vowel system will be treated with greater detail in the following chapter.

1. a. The acoustic distance between vocalic segments is much shorter in EGS than in standard Spanish
   b. The high and mid vowels in EGS are much more lax than they are in standard Spanish.
   c. The back vowels of EGS are produced in a more anterior position than they are in standard Spanish.

As pertains to the vowels of each language group, QCF compare their acoustic measurements to the cardinal vowels listed in Quilis (1981: 160) in order to draw a contrast with a more universal standard. Their observations are summarized in (2).

2. a. The /e/ and the /o/ of Fang and Bubi correspond to cardinal vowels /ɛ/ and /ɔ/.
   b. The /i/ and /u/ of Fang, Bubi, Annobonese, and Kombe correspond to cardinal vowels /e/ and /o/.
c. In Bubi the formant value for F1 /a/ is at the top range of the cardinal /a/ where Fang /a/ has approximately the same F1 as cardinal /a/.

2.3.1.1 Glottal stop epentheses

Glottal stops are reported as being frequently inserted to vowel initial and vowel final words, e.g. /aθian/ -> [ʔaθian], /sale/ -> [saleʔ]. QCF do not mention that this may be the effect of the surrounding phonological context. For example, a word final mid or low vowel may form a hiatus with a word initial mid or low vowel that is repaired through glottal stop insertion. That is, because onsetless syllables are unpreferred, the insertion of the glottal stop provides the syllable with an onset, e.g. /ando/ (VC.CV) -> [ʔan.do] (CVC.CV).

2.3.1.2 Articulatory instability

QCF report a high degree of articulatory instability in EGS vowels as illustrated in (3).

(3)   a. /e/ -> [i] [a] [o]  
b. /o/ -> [e] [a] [u]  
c. /i/ -> [e] [o]  
d. /u/ -> [o]  
e. /a/ -> [e] [i]

In cases where two vocalic phonemes of the L1 exist in the same acoustic space of one vocalic phoneme of the L2, e.g. Fang /i e/ for Spanish /e/, articulatory instability is more likely in terms of phonological interference, e.g. mulato -> molato, riguroso -> rigoroso. On the other hand, substitutions such as /a/ for /i/ where L1 acoustic space is clearly not the motivation, substitutions may be a reflection of incomplete lexical or morphological acquisition as opposed
to being strictly phonological, e.g. conducto -> conducta (gender ambiguity), patron -> patronos (association of /-o/ as masculine suffix) etc.

2.3.1.3. Vocalic deletion and insertion

The rules in (4) illustrate vocalic deletion and insertion.

\[(4)\]

a. \([i a u] \rightarrow \emptyset / \# \_\_, \ e.g. \ iguana \rightarrow guana, amigos \rightarrow migos, ahora \rightarrow ora, unos \rightarrow nos\]

b. \([\emptyset] \rightarrow [a e] / \# \_\_, \ e.g. \ guiñar \rightarrow [avįñar], bullir \rightarrow [eβuil̃ir]\]

There could be some phonological motivation behind deletion of the word initial vowel such as the elimination of an onsetless syllable in word initial position. In the case of epenthesis, QCF offer no possible motivation. In Fang, /g/ initial words are prohibited, and the insertion of a low vowel may be a manner in which to repair the non-native structure. However, this motivation does not hold for words that begin in /b/ or other allowable word initial consonants in Fang.

2.3.1.4. Hiatus resolution

Like many languages, Spanish also incorporates strategies for resolving vowel hiatus. In EGS, as in other dialects, diphthongization is reported as an active resolution strategy.

\[(5)\]

a. \([e] \rightarrow [j] / \_\_ [a õ], \ e.g. \ /peόɾ/ \rightarrow [pjόɾ], /teatro/ \rightarrow [tjatɾo] [a] __\]

b. \([o] \rightarrow [w] / \_\_ [é], \ e.g. \ /koéte/ \rightarrow [kwéte] [a] __\]

c. \([u i] \rightarrow [w j] / [e a] \_\_, \ e.g. \ [freir] \rightarrow [frejr], /pulmonía/ \rightarrow [pulmonjá] ___[a o]\]
In these observations there is nothing particularly characteristic or dialect specific except for the cases of diphthongization in the examples of the third case where there is a stress shift from the high vowel to the more sonorant one. In a later section in QCF dedicated to epenthetic segments hiatus contexts in words such as ríos and criollios are produced with /j/ between the vowels.

(6) /Ø/ -> [j] / i __ o, e.g. /rios/ -> [rijos], /krioʃos/ -> [krijoʃos]

2.3.2 Consonants

2.3.2.1 Stops

The inventory of stops in EGS is the same as that in standard Peninsular Spanish, i.e. the voiceless series /p t k/ and the voiced series /b d g/. The transformational processes listed below are among the most commonly attested in QCF.

2.3.2.1.2 Voiceless stops in onset position

The rules listed below describe patterns of changes that take place in voiceless stops in onset position. These include voicing, spirantization, retroflexation and palatalization.

(7) a. /p k/ -> [β ɣ] / [+cont] ___ [+cont], /θapato/ -> [θaβato], /koko/ -> [koɣo] (lenition)
b. /p/ -> [b] / [+nasal] ____, e.g. /tampoko/ -> [tamboko] (voicing)
c. /t d/ -> [t d], e.g. /motoʃ/ -> [moʃɔɾ] (retroflexing)
d. /tk/ -> [tʃkʃ] / ___[e i j], e.g. /tío/ -> [tʃio], /kemar/ -> [kʃemar] (palatalization)

e. /k/ -> [g] / V__V (voicing)

In (7a) /p/ and /k/ become voiced and subsequently undergo lenition between [+cont] sounds. In (7b) phoneme /p/ is voiced after a nasal segment. In (7e), /k/ is voiced when occurring between two vowels. In (7c) /ɣ/ and /ɬ/ are produced with retroflex articulation. Quilis does not state whether this is the result of the /ɣ/ occurring before a back vowel. In (7d) both /ɣ/ and /k/ are palatalized when occurring before a front vowel or glide.

### 2.3.2.1.3 Voiceless stops in coda position

Although the voiceless stops are reported as remaining intact in the majority of cases, the following processes were reported. They include voicing, lenition, and deletion. Their exact percentages in the data are not given.

(8)  

a. /ptk/ -> [b d g] / ___[C, -liquid], e.g. /adoptara/ -> /aðobtara/, /ritmo/ -> [ɾidmo]
b. /pk/ -> [β ɣ] / ___[C, -liquid], e.g. /adoptara/ -> /aðoβtara/
c. /ptk/ -> [Ø] / ___[C, -liquid], e.g. /adoptara/ -> /aðotara/, /futbol/ -> [ɾubol], /praktikar/ -> [ɾatikar]
d. /t/ -> [r] / ___[C V], e.g. /futbol/ -> [ɾubol]

In (8a) the voiceless stops are voiced in coda position before all consonants except liquids. In (8b) the voiceless stops are voiced and undergo lenition in coda position before all consonants that are not liquids. The intermediate step of voicing is not illustrated in the rule. In (8c) the voiceless stops are deleted in coda position before all consonant segments except liquids. The
notation denoting the prohibition of liquids “-liquid” is not meant to be interpreted as a distinctive feature.

Figure (8d) illustrates how the voiceless alveolar stop is converted into a flap before all consonants and vowels. In Spanish, however, these contexts are limited.

2.3.2.1.4 Voiced stops in onset position

Before pauses, nasal consonants, and after /l/ EGS is reported as producing the voiced stops in onset position in the same manner as they are produced in standard Spanish. However, the acoustic information provided in QCF fails to report on the glottal timing of these segments. That is, it is unknown whether they are produced with the characteristic leading VOT of Spanish or if the glottal timing remains neutral.

In contexts where voiced stops undergo lenition in Spanish, i.e. after continuant segments, EGS speakers typically either leave the stop intact or produce it with some degree of lenition. The norm in Spanish is to categorically produce the sound with lenition. QCF does not report the degree of lenition in EGS as compared to Standard Spanish. Table 2.4 below reports the percentages of lenition in EGS.

<table>
<thead>
<tr>
<th></th>
<th>/b/</th>
<th>/d/</th>
<th>/g/</th>
</tr>
</thead>
<tbody>
<tr>
<td>[b]</td>
<td>21.26%</td>
<td>40.6%</td>
<td>24.5%</td>
</tr>
<tr>
<td>[β]</td>
<td>78.7%</td>
<td>59.3%</td>
<td>75.6%</td>
</tr>
</tbody>
</table>

Table 2.4 Rates of spirantization of voiced stops

From Table 2.4 it is clear that lenition is preferred to maintain the underlying form. This is in conflict with the reports of Granda and Lipski where lenition was reported as a less common occurrence.
2.3.2.1.5. Processes for voiced stops in onset position

In EGS the processes such as changes in place of articulation, palatalization, lenition, as well as segment deletion are attested.

(9) a. /d/ -> [d] (dental -> alveolar, this was also the case for dental /t/)

b. /d/ -> [d], e.g. /kada/ -> [kaɗa] (retroflexing)

c. /d/ -> [d] / ___ [i e j], e.g. /día/ -> [día]

d. /d/ -> [ɾ] / [+cont] ___ [+cont], e.g. /todo/ -> [toro]

e. /d/ -> [l], /akomodo/ -> [akomolo] (lateralization)

f. /d/ -> [n], /akomodar/ -> [akomonar] (nasalization)

g. /b d g/ -> [Ø] / V __ V[l], e.g. /pueblo/ -> [pwelo], /según/ -> [seún], /xugada/ -> [xuaða]

One of the most interesting of these observations is the transformation of /d/ into both /l/ and /n/. The process of changing /d/ to /l/ is consistent with lenition phenomena whose ultimate trajectory of the segment is [Ø]. As for the /d/ segment, Hock (1986)’s weakening hierarchy illustrates this phoneme as either becoming a voiced fricative /ð/ or a liquid sonorant, i.e. /ɾ/ or /l/. For the case of /d/ becoming /n/ lenition can also be referred to as a possible motivation since it involves conversion to a segment with continuous airflow through the nose.

QCF (1995) fail to elaborate on the process in (9b) where the alveolar stop is produced with retroflex. This could be the result of segment transfer from one of the L1s besides Fang or Bubi that incorporates these segments. However, there is not enough information provided about these languages to make a real determination. The cause for the retroflex segments is most probably related to aerodynamic and articulatory reasons such as those encountered in Hamann and Fuchs
where the strategic goal behind retroflexion of /d/ is to allow for the generation of a more voluminous space behind the place of articulation in order to facilitate voicing. In this view, retroflexion can be labeled as a strategy to facilitate voicing which surfaces in interlanguage.

2.3.2.1.6 Voiced stops in coda position

Although voiced stops in coda position are rare in Spanish there are some cases where they do occur with high frequency, especially in words formed by prefixes such as /sub-/ or /ad-/ or in -gN- groups in words such as subdirector, adscrito, ignorante, diagnóstico etc. Additionally, these stops are almost always produced with allophonic variation. The only voiced stop that occurs word-finally in Spanish is /d/.

(10) a. /b d k/ -> [b d g] /__C, e.g. /absurdo/ -> [absurðo], /adxunto/ -> [adxunto], /ignorar/ -> [ignorar] (failure to undergo lenition)

b. /b d g/ -> [p d k] /__C, e.g. /absurdo/ -> [apsurðo], /admirar/ -> [atmirar], /ignorar/ -> [iknorar] (devoicing)

c. /b d g/ -> [β d γ] /__C, e.g. /absurdo/ -> [βsursurðo], /admirar/ -> [admirar], /ignorar/ -> [igñorar] (lenition)

d. /b/ -> [Ø] /__/, e.g. /obstante/ -> [ostante] (deletion)

e. /d g/ -> [Ø] /__C, e.g. /admirar/ -> [amirar], /ignorar/ -> [inorar] (deletion)

f. /d/ -> [t d Ø] /__#, e.g. /piedad/ -> [pjɛðat, pjɛðað, pjɛða] (devoicing, lenition)

g. /g/ -> [x] /__C, e.g. /ignorante/ -> [ixnorante] (devoicing and fricativization)

The processes that contrast with the Spanish norm are found in rules (10.a) and (10.g) above. For example, all Spanish dialects apply lenition to the contexts illustrated in (10.a) and almost
never maintain segmental integrity. It is also uncommon, if not unattested, for /x/ to serve as an allophone of /g/. These two points appear to be specifically characteristic of EGS.

### 2.3.2.1.7 Fricatives

QCF note that the native languages have the following fricative phonemes, /f/, /v/, /s/, /z/, and /h/. The exception is Bubi which is lacking /v/ and /z/. Some of the processes related to these sounds include substitution, palatalization, deletion, and fortition as shown in (11) below.

(11)  a. /f/ -> [fi], e.g. /franθesa/ -> [fɾanθesa]

      b. /s/ -> [s] / __ [j w], e.g. /siembra/ -> [sʃembra], /suerte/ -> [ʃjwerte]

      c. /s/ -> [Ø] / __ #, e.g. /estamos/ -> [estamo]

      d. /θ/ -> [f], e.g. /θelia/ -> [felja], /kantion/ -> [kamfjon]

      e. /x/ -> [h xʰ fi Ø], e.g. /paxita/ -> [pahita], /texado/ -> [texʰaðo], /baxar/ -> [bafar], /paxaro/ -> [paro]

      f. /x/ -> [k g j], e.g. /xente/ -> [kente], /ixo/ -> [igo] , /koxo/ -> [kɔyo]

The above processes that appear to be unique to EGS are /s/ palatalization, substitution of /θ/ with /f/, and the multiple allophones of the voiceless velar fricative /x/. Of these sounds neither /θ/ nor /x/ is included in the L1 consonant inventories. It is interesting to note that QCF maintain that the most common substitution of /f/ is the voiceless bilabial fricative /ɸ/ irrespective of how /f/ is produced in the L1.

### 2.3.2.1.8 Affricates
Affricates in general are produced with both articulator adduction followed by frication. The onset of the affricate is a stop sound followed by the continuity of the fricative. One way of measuring affricates is to capture the length of the stop and the fricative portions separately. The lone affricate in Spanish is that of the voiceless palatal /tʃ/ in words such as chico, muchacho etc. The affricates of the native languages of Equatorial Guinea are produced with the articulators situated closer to the alveolar ridge. QCF have described the affricates in EGS as being prepalatal irrespective of how they are produced in the L1. They do note, however, that there are three different variations for this sound: 1) stop followed by a fricative, 2) soft fricative followed by more intense fricative, and 3) fricative followed by a stop followed again by a fricative. QCF’s acoustic analysis of these sounds revealed that in the first type the stop has a duration of 80 msec. with a 55 msec. duration for the fricative. In the second type, the first fricative has a duration of 52 msec. followed by a stronger fricative with a duration of 77 msec. In the third type the first fricative lasts for 28 msec. followed by a 40 msec. stop articulation and a final fricative with a duration of 110 msec.

Even thought the majority of QCF’s participants were said to have produced prepalatal affricates, they mention two other variations that were also observed; the alveopalatal affricate, which is produced is a position of more anteriority than the prepalatal version, and the alveolar affricate, which is the allophone with the most [anterior] position.

2.3.2.1.9 Nasals

Most of the native languages of Equatorial Guinea possess four nasal phonemes, /m/, /n/, /ɲ/, and /ŋ/ which can typically occur in any word position. QCF recognize the fact that most of the native languages also have co-articulated nasal consonants /mb/, /nd/, /ns/, /ng/ and /nk/, that act
as individual phonemes. However, since these sounds are not part of the Spanish inventory they were not addressed in the analysis.

2.3.2.1.9.1. Bilabial nasal

According to QCF the bilabial nasal typically undergoes deletion when occurring in word final position. Since the Spanish lexicon is lacking in word final bilabial nasals save for a few loan words, the process of deletion as illustrated in (12) is rarely attested.

(12) /m/ -> Ø / __ #, e.g. /album/ -> [albû]

Notice in (12) that although /m/ is deleted the nasality is spread to the preceding vowel. It is also interesting to note that the deletion of word final /m/ is unattested in Fang so its occurrence in the Spanish of Fang L2s could be an artifact of an interlanguage phenomenon.

2.3.2.1.9.2. Alveolar nasal

The alveolar nasal also undergoes some processes in spoken production. These mainly involve deletion in different linguistic contexts, palatalization, substitution.

(13) a. /n/ -> Ø / V __ V, e.g. /kadena/ -> [kaðêa]

b. /n/ -> Ø/ __ #, e.g. /timôn/ -> [timô]

It is also stated that the vowel preceding the nasal sometimes results as nasalized after deletion, e.g. /komen/ -> [komê]/[kome]. The intricacies of this assimilatory procedure are
impossible to capture through linear descriptions. For the general purposes of this section, it should suffice to say that the [nasal] feature of the nasal segment spreads to the preceding vowel regressively.

\[(14) \quad a. /n/ \rightarrow [nj \ n] / \_ \ [i \ v \ w \ j], \text{ e.g. } /benieron/ \rightarrow [ben\_jeron], /benieron/ \rightarrow [ben\_jeron]\]

\[b. /n/ \rightarrow [l], \text{ e.g. } /kordones/ \rightarrow [kordoles]\]

In (14a) the alveolar nasal becomes palatalized either through its conversion into a palatal nasal proper or though the insertion of a palatal glide [j]. This process occurs before front vowels and front and back glides. The substitution of the alveolar nasal by \(/l/\) may be indicative of the process of lenition as \(/l/\) is more sonorant than \(/n/\).

\[2.3.2.19.3. \text{Palatal nasal}\]

Processes for the palatal nasal include glide formation, deletion and change in place of articulation to a less marked [alveolar] place.

\[(15) \quad a. /n/ \rightarrow [\_j] / V \_ V, \text{ e.g. } /le\_j\_a/ \rightarrow [le\_j]\]

\[b. /n/ \rightarrow [\_\_O] / V \_ V, \text{ e.g. } /ba\_\_amos/ \rightarrow [ba\_\_amos]\]

\[c. /n/ \rightarrow [n] / V \_ V\]

In some dialects of Spanish the velar nasal results as an allophone of word final alveolar nasal, e.g. \(/son/ \rightarrow [so\_n]. However, this characteristic is most common in the dialects of southern Spain and the Caribbean. None of the three studies here have reported word final velarization of
/n/ in the Spanish of Equatorial Guinea. The process above involves the conversion of the palatal nasal into a glide, which can be motivated as a process of lenition since glides are more sonorant than nasals. In QCF’s observation, the glide maintains the nasal feature of the nasal segment (15a). In (15b) the palatal nasal segment undergoes complete effacement and in (15c) it becomes an alveolar nasal.

2.3.2.19.4 Nasal epenthesis

This process is described in QCF as the insertion of an archiphonemic nasal segment -/N/- that occurs sporadically before voiced and voiceless consonants in EGS without much systematicity. It is observed as occurring with greater frequency before voiced stops. Some examples are given below.

(16)  a. /bueno/ -> [mbweno]
     b. /moises/ -> [moinses]
     c. /rodar/ -> [rondar]

QCF offer no explanation for this phenomenon other than that it is sporadic and that it also occurs in the native languages. At least in the case of Fang, however, sporadic prenasalization is only reported as occurring before the phoneme /z/. Phonemic substitution of simple consonants in the L2 with complex prenasal consonants in the L1 may have something to do with these observations. For example, the status of /b/ in word initial position in Fang is quite rare without a nominal nasal prefix. On the other hand, words beginning with the phoneme /mb/ are common. However, this is a controversial statement because /mb/ segments are in theory significantly
shorter than /m+b/. In Piñeros (2003) prenasalized voiced stops in Palenquero Spanish of Colombia were said to be a strategy of segmental lenition. However, no studies to date have addressed the issue of spontaneous prenasalization including prenasalized voiceless stops and fricatives as reported in QCF.

2.3.2.1.9.5. Nasal + consonant sequences

When the alveolar nasal precedes the bilabial nasal, /nm/, QCF note that the sequence is either fully articulated or the /m/ is deleted and the /n/ is lengthened, e.g. /kolumna/ -> [kolun:a]. Again, linear rule notation fails to capture the fact that this procedure is affected by processes such as assimilation or segmental lengthening. A representation is given below using an autosegmental representation (e.g. Goldsmith, 1990).

(17)

```
/m/  /n/  ->  [n:]

P         P
[lab] [-lab]
```

The autosegmental representation in the first rule assumes that the bilabial nasal assimilates to the place of the alveolar nasal which then results as a lengthened segment. However, this may not be the case when we observe what happens in /nm/ clusters in words like inmensa, inmienda.

(18)

```
/n/  /m/  ->  [m]
```

66
In the second rule there appears to be assimilation but no segment lengthening to indicate that /m/ has been deleted in a non-categorical fashion. In the first rule the assimilation of [-lab] must be gradient as it leaves behind a trace of its original existence reflected in the lengthened segment. The second rule is most probably better represented in (19).

(19)  \( /n/ \rightarrow [\emptyset] / \_\_ [m] \)

QCF note that /ns/ sequences are produced with 63% accuracy as reflected in their data. However, for the other 37% the nasal segment is deleted. Though exact numbers are not given, QCF also note that /n/ deletion is also active in /nb/ sequences. Since no sign of segment lengthening is noticed in the data of either /s/ or /b/ we might assume that deletion is categorical in both cases.

(20)  a. /n/ \rightarrow [\emptyset] / \_\_ [s], e.g. /konstante/ \rightarrow [kostante]

b. /n/ \rightarrow [\emptyset] / \_\_ [b], e.g. /taNbiem/ \rightarrow [tabjen]

2.3.2.1.10 Liquids

According to QCF the four L1s involved in the study all have the alveolar tap /ɾ/ and the lateral approximate /l/ in their phonemic inventories. However, the trilled /ɾ/ and the palatal
liquid /ʎ/ are missing from each consonantal inventory. In intervocalic position it is observed that the tap is sometimes produced as a trill.

(21)  /tʃ/ -> [ɾ] / V _ V

When preceded by a consonant, /tʃ/ frequently deletes. Some examples are words such as problema, pudren, nombre produced as problem, puden, nome etc. In other contexts, however, the non-liquid consonant deletes leaving /tʃ/ in word initial position. In the data this was specifically observed when occurring with /g/. As a result QCF note that the trilling rule is applied as Spanish prohibits the flap in word initial position. This can be illustrated in a two step rule.

(22)  a. /g/ -> [Ø] / _[ɾ]
      b. /tʃ/ -> [ɾ] / #_

    e.g. /gruɲir/ -> [ruɲir] -> [ruɲir]

Another frequent observation that QCF make pertaining to /tʃ/ clusters is the high frequency of palatalization of the non-liquid sonorant as a result of glide formation of /tʃ/. This is especially common in /d/ and /t/ segments.

(23)  a. /tʃ/ -> [j] / [d t] __
      b. /d/ -> [dj] / ___ [j]

    e.g. /ladron/ -> [ladʃon], /kuatro/ -> [kwatɾo]
When the flap occurs in coda position it either deletes or causes an epenthetic vowel to occur between itself and the following consonant.

(24)  

a. /ɾ/ -> [Ø] / __ [C], e.g. /korbata/ -> [koʃata], /forma/ -> [foma]

b. /ɾ/ -> [Ø] / __ #, e.g. /buskar/ -> [buska]

c. Ø -> [V] / [ɾ] __ [C], e.g. /korneta/ -> [koroneta]

The epenthetic process shown in (24c) has also been observed in English L1 learners of Spanish in the early stages of acquisition (Major, 1986). Epenthesis between these segments is not common in native Spanish dialects, though the addition of svarabhakti vowels is (e.g. Quilis, 1988, Navarro Tomas, 1918). The obvious problem here, as noted by QCF, is the non-native phonotactic pattern. However, at least in Fang, /ɾ/ is allowed to occur in coda position before a consonantal segment across word boundaries.

2.3.2.10.1 Trilled /ɾ/

Because the native languages of Equatorial Guinea do not possess trilled /ɾ/ in their phonemic inventories, this sound is said to result in frequent inaccuracies in EGS. According to the researchers the most common substitution for the trill is the native alveolar flap /ɾ/ which is documented as occurring 51.46% of the time in word initial position and 64.2% of the time in word medial position. The majority of the other 58.54% and 35.8% are produced correctly as the trilled /ɾ/. In some rare cases, however, /ɾ/ in both word initial and word medial position is produced as the liquid sibilant /ɾ/.

2.3.2.10.2 Lateral approximant
Although there is a /ɾ/-/l/ distinction in the native languages of Equatorial Guinea, the flap often substitutes the lateral approximate as observed in Japanese English (e.g. Mackain, Best, Strange, 1981). The researchers note, however, that the process is also observed reversely, i.e. /ɾ/ -> /l/. Other phenomena involve palatalization of /l/, as well as /l/ deletion.

(25) a. /l/ -> [ɾ], e.g. /plaktika/ -> [praktika], /kolera/ -> [korera]
    b. /ɾl/ -> [l], e.g. /iglesja/ -> [igresja], /ablo/ -> [abro]
    c. /l/ -> [lj]/ [i u], e.g. /familja/ -> [famíja]
    d. /l/ -> [Ø] / _ _ , e.g. /familja/ -> [famía], /igual/ -> [igwá]

2.3.2.1.10.3 Palatal lateral

QCF indicate that well-educated Equatorial Guineans typically show a great deal of accuracy in producing the palatal lateral through their constant exposure and usage of formal Spanish. However, they emphasize that since this phoneme is absent in the L1s, its usage tends to exhibit variation, especially amongst less educated speakers. Some of these variants include: [lj] and [l]. In other cases, the /ʎ/ is deleted altogether.

(26) a. /ʎ/ -> [lj], e.g. /tɔrtiʎa/ -> [tɔrtlja], /poʎo/ -> [poljo]
    b. /ʎl/ -> [l], e.g. /aʎl/ -> [alí], /poʎito/ -> [polito]
    c. /ʎ/ -> [Ø], e.g. /kutʃiʎo/ -> [kutʃío], /eʎos/ -> [éos], /gaʎina/ -> [gaína]
The deletion process of /ʎ/ was acoustically analyzed by QCF to investigate whether any trace of this segment would be detected. The authors discovered that there was absolutely no sign of the palatal consonant in the spectrographic evidence.

2.3.3 Suprasegmentals

The final section in QCF focuses on word stress, tone, and sentence intonation. With respect to the relationship between tone and word stress, the authors state that the accent of individual words in EGS is expressed through the assignment of high tone. This is also reported in Lipski (2008) where it is suggested that the Spanish accent of intensity is correlated to high tone in non-accent assigning languages like Fang and Bubi. Lipski also adds that the same phenomenon is observed in the case of Spanish loan words of the native languages. Although word stress is substituted by high tone assignment it does not always appear where one would expect as there is much variation observed in the assignment of the stress-bearing property, e.g. /kadáber/ -> [kaðaβér], /garapáatos/ -> [garápatos]. In these examples it seems as though stress is assigned arbitrarily perhaps because the speakers of the native languages do not register the change in intensity in the acoustic signal of EGS. In the data shown in their study there seems to be very little pattern formation in stress assignment, e.g. following the stress to weight principle (Kager, 1999).

In the comparison of sentence intonation QCF recorded the movement of the fundamental frequency (F0) of the same declarative sentence as Spoken by a native Fang speaker and a Spanish speaker from Madrid, both of the same level of education. In the native Spanish speaker the F0 remained at the same level until encountering the first accented syllable where it then proceeded to fall until the end of the sentence. For the native Fang speaker the F0 remained at
the same level through the duration of the sentence without exhibiting any overall tendency toward the falling sentential intonation associated with Spanish declarative sentences. The researchers also noted that the sentence was produced at a much slower pace in the Fang native speaker. As for interrogatives, the Fang speaker exhibited the same pattern of rising intonation as that of the Spanish speaker, irrespective of the fact that such an intonation pattern does not exist in the L1.

The role of suprasegmental phenomena in the present study is a secondary one and the intention is to focus primarily on segmental phenomena.

2.4 Summary

Of the three EGS studies covered in this section one utilized participants from a specific language group (Granda, 1985) while the other two used a variety of L1s, especially in the case of Lipski (1985). In both Lipski and QCF phenomena in the L2 were mentioned that the researchers claimed were not related in any manner to the structure of the L1. In Lipski’s terms, this is indicative of the formation of a regional dialect that can be labeled “Equatorial Guinean Spanish.” It was also mentioned in Lipski (1985), however, that no specific L1 could be identified by listening to speakers of EGS because of supposed homogeneity in the grammatical structures of the L1s.

In QCF the researchers do not identify a specific dialect of EGS but simply outline how Spanish is spoken by L1 speakers of four different native languages (the title of their study implies this view, “La lengua española en Guinea Ecuatorial” “The Spanish language in Equatorial Guinea”). Although some cross-linguistic similarities were highlighted the researchers regularly identify characteristics that could be traced to the individual L1s. QCF tend to treat the Spanish of Equatorial Guinea as a second language with some phonological similarities
irrespective of the ethnic group. However, their data show a high degree of variability and not all of the attested variations are given one to one comparisons to the respective L1s. For example, the extreme variability in /x/ production is not described as an effect of any particular L1 nor is it described as a characteristic of EGS as a whole.

Tables 5-12 below contrast the findings of Granda, Lipski and QCF. Since Granda did not analyze vowels, his study is excluded from the first two tables. The most important information to extract from these comparisons is the amount of disparity between them, especially between Lipski and QCF. It is a rather surprising observation that QCF would encounter significantly more allophonic variation in their results since they utilized less data and only four L1 backgrounds. Lipski, on the other hand, utilized participants from over eight linguistic backgrounds and analyzed over 40 hours of spoken data. To some extent one would expect to find less variation in Granda since only Fang L1s were used. Indeed, if Equatorial Guinean Spanish were to be viewed as a dialect of Spanish as opposed to an L2 one would not expect the wide disparities between the three studies covered in this chapter, i.e. all of them should report roughly the same information.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/a/</td>
<td>[a]</td>
<td>[ä i e ]</td>
</tr>
<tr>
<td>/e/</td>
<td>[e]</td>
<td>[e o a i]</td>
</tr>
<tr>
<td>/i/</td>
<td>[i]</td>
<td>[i o e]</td>
</tr>
<tr>
<td>/o/</td>
<td>[o]</td>
<td>[o e a u]</td>
</tr>
<tr>
<td>/u/</td>
<td>[u]</td>
<td>[u o]</td>
</tr>
</tbody>
</table>

Table 2.5 Vowel segments - Lipski, QCF
### Table 2.6 Vowel sequences – Lipski, QCF

<table>
<thead>
<tr>
<th>Vowel sequence</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ai/</td>
<td>[e aj]</td>
<td>[e aj]</td>
</tr>
<tr>
<td>/au/</td>
<td>NA</td>
<td>[o aw]</td>
</tr>
<tr>
<td>/eu/</td>
<td>[u ew]</td>
<td>[u ew]</td>
</tr>
<tr>
<td>/ue/</td>
<td>NA</td>
<td>[o we]</td>
</tr>
<tr>
<td>/ie/</td>
<td>NA</td>
<td>[je]</td>
</tr>
<tr>
<td>/ea/</td>
<td>NA</td>
<td>[êa ja]</td>
</tr>
<tr>
<td>/ae/</td>
<td>NA</td>
<td>[aê]</td>
</tr>
<tr>
<td>/oe/</td>
<td>NA</td>
<td>[oê we]</td>
</tr>
<tr>
<td>/eo/</td>
<td>NA</td>
<td>[êo êo ew]</td>
</tr>
<tr>
<td>/eû/</td>
<td>NA</td>
<td>[êu]</td>
</tr>
<tr>
<td>/aí/</td>
<td>NA</td>
<td>[áj]</td>
</tr>
<tr>
<td>/eú/</td>
<td>NA</td>
<td>[êj]</td>
</tr>
<tr>
<td>/á/</td>
<td>NA</td>
<td>[já]</td>
</tr>
</tbody>
</table>

### Table 2.7 Voiceless stops – Granda, Lipski, QCF

<table>
<thead>
<tr>
<th>Voiceless stop</th>
<th>Granda</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/p/</td>
<td>NA</td>
<td>[p]</td>
<td>[b β p ñ -Ø]</td>
</tr>
<tr>
<td>/q/</td>
<td>[t]</td>
<td>[t ū]</td>
<td>[t ū t - d ū - ð - Ø]</td>
</tr>
<tr>
<td>/k/</td>
<td>[k ū kʰ kʲ]</td>
<td>[k]</td>
<td>[k g ū -Ø]</td>
</tr>
</tbody>
</table>

### Table 2.8 Voiced stops – Granda, Lipski, QCF

<table>
<thead>
<tr>
<th>Voiced stop</th>
<th>Granda</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/b/</td>
<td>[b ð]</td>
<td>[b]</td>
<td>[b β -p -b -Ø]</td>
</tr>
<tr>
<td>/d/</td>
<td>[d -t]</td>
<td>[d ū]</td>
<td>[d ū d - ð - d¹ - r - 1 n - -t# - -Ø#]</td>
</tr>
<tr>
<td>/g/</td>
<td>[g ū gʰ gʲ]</td>
<td>[g]</td>
<td>[g Ø y]</td>
</tr>
</tbody>
</table>

### Voiceless fricatives

<table>
<thead>
<tr>
<th>Voiceless fricatives</th>
<th>Granda</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/s/</td>
<td>[s]</td>
<td>[s]</td>
<td>[s -Ø]</td>
</tr>
<tr>
<td>/θ/</td>
<td>[θ ū s]</td>
<td>[θ ū s]</td>
<td>[θ s f]</td>
</tr>
<tr>
<td>/x/</td>
<td>[x ū ð x]</td>
<td>[x ū h]</td>
<td>[x ū h xʰ Ø k]</td>
</tr>
<tr>
<td>/f/</td>
<td>[f]</td>
<td>[f]</td>
<td>[f ø θ]</td>
</tr>
</tbody>
</table>
Table 2.9 Voiceless fricatives – Granda, Lipski, QCF

<table>
<thead>
<tr>
<th>Voiceless Affricate</th>
<th>Granda</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/tʃ/</td>
<td>[ts]</td>
<td>[tʃ]</td>
<td>[tsʃ]</td>
</tr>
</tbody>
</table>

Table 2.10. Voiceless affricates – Granda, Lipski, QCF

<table>
<thead>
<tr>
<th>Nasals</th>
<th>Granda</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/m/</td>
<td>[m]</td>
<td>[m]</td>
<td>[m – Ø]</td>
</tr>
<tr>
<td>/n/</td>
<td>[n l]</td>
<td>[n -m -ŋ]</td>
<td>[Ø n ŋ n’ n ŋ l m]</td>
</tr>
<tr>
<td>/ŋ/</td>
<td>[ŋ n]</td>
<td>[n ŋ – Ø]</td>
<td>[ŋ ŋ – Ø n]</td>
</tr>
</tbody>
</table>

Table 2.11. Nasals – Granda, Lipski, QCF

<table>
<thead>
<tr>
<th>Liquids</th>
<th>Granda</th>
<th>Lipski</th>
<th>QCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ɾ/</td>
<td>[ɾ]</td>
<td>[ɾ]</td>
<td>[ɾ ŋ Ø j]</td>
</tr>
<tr>
<td>/r/</td>
<td>[ɾ r]</td>
<td>[ɾ r]</td>
<td>[ɾ ŋ r R]</td>
</tr>
<tr>
<td>/l/</td>
<td>[l ŋ n]</td>
<td>[l]</td>
<td>[l ŋ ŋ’ Ø n]</td>
</tr>
<tr>
<td>/ʎ/</td>
<td>[j Ø]</td>
<td>NA</td>
<td>[ʎ ŋ ŋ’ Ø ]</td>
</tr>
</tbody>
</table>

Table 2.12. Liquids – Granda, Lipski, QCF

It is reiterated here that the differences between these three studies lend sufficient credence to the notion that Spanish in Equatorial Guinea holds second language status. Otherwise, one would expect less variation based on the L1. This observation becomes exceptionally obvious in assessing the disparities in allophonic variation in segments such as /l/, /ɾ/, /n/, /x/, /d/, /b/, /p/, and /p/ in each study.
The following chapter presents a contrastive analysis of the selected target items of Fang and Spanish. The goal of the chapter is to develop a series of hypotheses based on the predicted differences as well as similarities between the two languages.
Chapter 3

3. Contrastive analysis

The purpose of this chapter is to contrast in both Spanish and Fang the phonological phenomena that will be tested in the present study. The chapter commences by comparing the broad differences between the vocalic and consonantal systems of both languages. It then proceeds by drawing a side by side comparison of the nine linguistic target items tested in the present study. It would be ideal to compare all the items in both Fang and Spanish, but for spatial reasons such a comparison goes beyond the scope of the study. The chapter ends by presenting the hypotheses that will be tested.

3.1 Spanish and Fang vowels

The phonemic vowel inventories of Fang and Spanish are compared in Figure 3.1 above (the measurements of which are based on Quilis & Casado-Fresnillo, 1995 for Fang and Quilis & Esgueva, 1983 for Spanish). One obvious distinction between the two systems is the two...
additional phonemes - /ɛ/ and /ɔ/ - in Fang allowing for this language to generate more vocalic distinctions. The numbers on the horizontal lines represent F2 values in Hz while the numbers on the vertical axis represent F1 values. A high F2 indicates a more anterior placement of the tongue body, which results in a smaller front chamber of the mouth. The smaller chamber favors high frequencies. Contrastively, the F1 results from the amount of space in the throat and larynx. The more open this space is, the lower the frequency will be. For example, the high front vowel /i/ has a low F1 value because more space is opened in the throat during the forward movement of the root.

Another very salient difference between these vowel systems is the lack of utilization of the upper region of the vowel space in Fang. As a result, the high vowels in Fang are relatively low and extremely close to the mid vowels. In Spanish, on the other hand, the high vowels are clearly distanced from the mid vowels as their F1 values are significantly lower than their Fang counterparts. Additionally, the mid vowels in Fang appear to be in an atypically high position leaving a significant amount of space between themselves and the lax mid vowels.

Both /i/ and /e/ in Fang occupy a significantly more anterior position than their Spanish counterparts. This results in a significant amount of unutilized acoustic space between themselves and the back vowels. The low central vowel /a/ in Fang is also significantly more fronted and lower than what is reported in Spanish.

It is important to mention that there also exists a length distinction in Fang vowels which raises the number of vowel phonemes significantly. Examples of length distinction in Fang are given in (1) below (Bibang Oyee, 1990).

(1)   a. /á-ba/ “leave”, /á-baa/ “cut down”
b. /ekp/ “pocket”, /ekpaa/ “Ekpaa (a name)”
c. /beé/ “beé (a name)”, /beé/ “two”

Unfortunately, very little research has been carried out on the Fang language and there is no body of information available with respect to the details of phoneme distribution. To tentatively rectify this situation, frequency counts were performed on the lexicon included in the appendix of Bibang-Oyee which comprises of approximately 1,500 citation forms\textsuperscript{14}. The results were compared with the frequency of Spanish vowels as reported in Piñeros (2009). These are shown in Table 3.1 below.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Fang</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>/a/</td>
<td>32%</td>
<td>31%</td>
</tr>
<tr>
<td>/e/</td>
<td>28%</td>
<td>27%</td>
</tr>
<tr>
<td>/i/</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>/o/</td>
<td>11%</td>
<td>21%</td>
</tr>
<tr>
<td>/u/</td>
<td>9%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Table 3.1 Frequency of Spanish and Fang vowels

The distribution between Fang and Spanish vowels is quite similar, differing significantly in the values for /o/ and /i/. It was also confirmed with another search that both /i/ and /u/ are prohibited from occurring in word initial position in Fang; a detail that is mentioned in Bibang Oyee as well. In assessing the validity of the Fang data it is important to keep in mind that the lax vowels /ɛ/ and /ɔ/ could not be independently analyzed because they are represented orthographically by /e/ and /o/ respectively. Thus, the numbers reported for the “pure” mid

\textsuperscript{14} In order to expedite the counting process the lexicon was digitalized with OCR imaging and run through a frequency script in Perl.
vowels are most probably lower. Long vowels, which are always represented as double vowels in the orthography, were also excluded in the analysis.

### 3.2 Consonants

Tables 3.2-3.3 exhibit the consonant inventories of Spanish and Fang.

<table>
<thead>
<tr>
<th></th>
<th>bilabial</th>
<th>Labiodental</th>
<th>dental</th>
<th>alveolar</th>
<th>Alveopalatal</th>
<th>palatal</th>
<th>Velar</th>
<th>Labiovelar</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP</td>
<td>VL</td>
<td>/p/</td>
<td>/t/</td>
<td>/ʃ/</td>
<td>/k/</td>
<td>/ɡ/</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>/b/</td>
<td>/d/</td>
<td>/ʒ/</td>
<td>/ɡ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRICATIVE</td>
<td>VL</td>
<td>/f/</td>
<td>/θ/</td>
<td>/s/</td>
<td>/ʃ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NASAL</td>
<td>V</td>
<td>/m/</td>
<td>/n/</td>
<td></td>
<td>/p/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LATERAL</td>
<td>V</td>
<td>/l/</td>
<td>/ɾ/</td>
<td></td>
<td>/ɾ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLAP</td>
<td>V</td>
<td>/ɾ/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRILL</td>
<td>V</td>
<td>/r/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLIDE</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/j/</td>
<td>/w/</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.2. Spanish consonant inventory (Adapted from Whitley, 2002)

<table>
<thead>
<tr>
<th></th>
<th>bilabial</th>
<th>Labiodental</th>
<th>dental</th>
<th>alveolar</th>
<th>Alveopalatal</th>
<th>palatal</th>
<th>Velar</th>
<th>Labiovelar</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP</td>
<td>VL</td>
<td>(p)</td>
<td>/t/</td>
<td></td>
<td>/k/</td>
<td>/ɡ/</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>/b/</td>
<td>/d/</td>
<td></td>
<td>/ɡ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AFFRICATE</td>
<td></td>
<td></td>
<td>/tʃ/</td>
<td></td>
<td>/ɡ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRICATIVE</td>
<td>VL</td>
<td>/θ/</td>
<td>/s/</td>
<td></td>
<td>/ʃ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NASAL</td>
<td>V</td>
<td>/m/</td>
<td>/n/</td>
<td></td>
<td>/p/</td>
<td>/ɲ/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LATERAL</td>
<td>V</td>
<td>/l/</td>
<td>/ɾ/</td>
<td></td>
<td>/ɾ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLAP</td>
<td>V</td>
<td>/ɾ/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRILL</td>
<td>V</td>
<td>/r/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLIDE</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/j/</td>
<td>/w/</td>
<td></td>
</tr>
<tr>
<td>NASAL</td>
<td>V</td>
<td>/nd/</td>
<td></td>
<td></td>
<td>/ŋ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STOP</td>
<td>NASAL</td>
<td>/mv/</td>
<td></td>
<td></td>
<td>/ŋz/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRICATIVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.3 Fang consonant inventory (Bibang Oyee, 1990; Medjo Mvé, 1997)

As can be observed in Tables 3.2 and 3.3 above, the Fang inventory is larger than the Spanish inventory by five phonemic segments, four of which are prenasalized consonants.
According to the literature, these are to be considered as unitary and not as segments with a preceding syllabic nasal attached (e.g. Ladefoged & Maddieson, 1993 for similar segments in other Bantu languages).

In Bibang Oyee, the voiceless bilabial stop /p/ is said to be a member of the consonant inventory but it is excluded in Medjo Mvé’s description. The consonant /p/, according to Bibang Oyee, only occurs in words of foreign origin. Languages lacking /p/ are quite common especially along the eastern Sudanic belt, e.g. Afro-Asiatic, but less so to the western extreme.

Although the Spanish consonant inventory is notably smaller it is not lacking in complexity in comparison to the phonemes of Fang. The Spanish system contains five segments that are not part of the system of Fang. These are /θ/, /ʃ/, /ʎ/, and /x/. If we count /p/ as a foreign phoneme of Fang, then the L2 system contains six non-native segments.

Comparing against the frequency percentages in Piñeros (2009) an independent analysis was performed on the same sample lexicon utilized for the vowel frequency distributions in the previous section. Table 16 illustrates the differences in consonant distribution between Fang and Spanish. Again, the data for Fang is based on the lexicon in the appendix of Bibang Oyee (1990). Since Fang does not possess a written form, corpora on the language are not readily available.

<table>
<thead>
<tr>
<th>Segment</th>
<th>Fang</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>11.04%</td>
<td>2.70%</td>
</tr>
<tr>
<td>K</td>
<td>9.52%</td>
<td>4.00%</td>
</tr>
<tr>
<td>S</td>
<td>7.48%</td>
<td>9.80%</td>
</tr>
<tr>
<td>M</td>
<td>7.34%</td>
<td>3.00%</td>
</tr>
<tr>
<td>L</td>
<td>6.94%</td>
<td>4.20%</td>
</tr>
<tr>
<td>F</td>
<td>5.07%</td>
<td>0.80%</td>
</tr>
<tr>
<td>G</td>
<td>4.90%</td>
<td>1.00%</td>
</tr>
<tr>
<td>N</td>
<td>4.67%</td>
<td>7.20%</td>
</tr>
<tr>
<td>Dz</td>
<td>4.32%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>
As seen in Table 3.4 the five most frequent consonants of Fang are /b/, /k/, /s/, /m/, and /l/ while the five most frequent consonants of Spanish are /s/, /n/, /ɾ/, /t/, and /l/. If frequency can be used as a measure of markedness (e.g. Hume, 2011) and high frequency sounds are typically the less marked and more subject to modification, then one would expect the most consonantal variation to occur in these most common sounds within the L1. As far as Fang L1s are concerned, all of the most frequent sounds on the L2 are also part of the L1 inventory. However, segments /ɾ/ and /ɾ/ are significantly less common.

It is interesting to note from Table 3.5 that the prenasalized consonants are either of the same or less frequency than the consonant to which they prenasalize, e.g. /C1…/ is more common or equal to /NC1…/. This is an important observation when considering the possible transfer of prenasalized segments into the L2. That is, it is of less probability based on L1 frequency that

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Frequency 1</th>
<th>Frequency 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>4.32%</td>
<td>4.40%</td>
</tr>
<tr>
<td>Z</td>
<td>4.23%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Y</td>
<td>4.09%</td>
<td>0.70%</td>
</tr>
<tr>
<td>V</td>
<td>3.83%</td>
<td>0.00%</td>
</tr>
<tr>
<td>D</td>
<td>3.52%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Ng</td>
<td>3.20%</td>
<td>0.00%</td>
</tr>
<tr>
<td>r</td>
<td>3.12%</td>
<td>5.40%</td>
</tr>
<tr>
<td>Ts</td>
<td>2.31%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Nd</td>
<td>2.18%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Ñ</td>
<td>1.60%</td>
<td>0.20%</td>
</tr>
<tr>
<td>Kp</td>
<td>1.51%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Mv</td>
<td>1.51%</td>
<td>0.00%</td>
</tr>
<tr>
<td>P</td>
<td>1.47%</td>
<td>2.70%</td>
</tr>
<tr>
<td>D</td>
<td>1.38%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Nz</td>
<td>0.45%</td>
<td>0.00%</td>
</tr>
<tr>
<td>X</td>
<td>0%</td>
<td>0.60%</td>
</tr>
<tr>
<td>Θ</td>
<td>0%</td>
<td>1.50%</td>
</tr>
<tr>
<td>R</td>
<td>0%</td>
<td>0.90%</td>
</tr>
<tr>
<td>tʃ</td>
<td>0%</td>
<td>0.30%</td>
</tr>
</tbody>
</table>

Table 3.4 Spanish & Fang Relative consonant frequency
NC1… would replace C1… in the L2, e.g. changes like bueno -> mbueno “good”, and monaguillo -> monanguillo “alter boy,” could be an effect of a phonological process rather than of L1 transfer as an effect of frequency.

<table>
<thead>
<tr>
<th>NC</th>
<th>Frequency</th>
<th>C</th>
<th>Frequency</th>
<th>Difference C</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ng/</td>
<td>3.20%</td>
<td>/g/</td>
<td>4.90%</td>
<td>+1.70%</td>
</tr>
<tr>
<td>/nd/</td>
<td>2.18%</td>
<td>/d/</td>
<td>3.52%</td>
<td>+1.34%</td>
</tr>
<tr>
<td>/mv/</td>
<td>1.51%</td>
<td>/v/</td>
<td>3.83%</td>
<td>+2.32%</td>
</tr>
<tr>
<td>/nz/</td>
<td>.45%</td>
<td>/l/</td>
<td>4.23%</td>
<td>+3.78%</td>
</tr>
</tbody>
</table>

Table 3.5 Relative frequency of prenasal consonants in Fang

Given the differences in segmental distribution in the L1 it can be postulated that frequency is probably less likely of an influential factor in cases of prenasalization in the L2. However, if frequency were to be taken into account, it would most probably be attested in /nd/ substitution of /d/ and /ng/ substitution of /g/, e.g. rodar -> rondar, monaguillo -> monanguillo. Since neither /z/ nor /v/ exists in the L2 there would be no need to replace them with an L1 segment. Note that words such as rondar and monanguillo are of the most common replacement types as reported in QCF (1995).

3.3 Phenomena tested in the present study

Table 3.6 exhibits the linguistic phenomena that will be tested in the present study. They were selected on the basis of potential ease of comparison, meaning that they lent themselves to clearly testable hypothesis formation within the CAH framework. They are divided into phenomena from the L1 that are expected to transfer either positively or negatively to the L2 and

---

15 It should be pointed out that in Spanish these intervocalic consonants would be produced with spirantization and nasalization could represent a manner in which native Fang speakers deal with the process since it is uncommon in their L1. However, intervocalic /g/ in Fang is spirantized between non-identical vowels, as is the case in words such as monaguillo where it is flanked by /a/ and /i/.
phenomena that are non-existent in the L1 and must be acquired in order to competently produce the L2.

<table>
<thead>
<tr>
<th>Items</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>/V(#)dV/</td>
<td>Voiceless dental stop between vowels in word initial or word medial position</td>
<td>busca tanta, ataduras</td>
</tr>
<tr>
<td>/V(#)gV/</td>
<td>Voiced dental stop between vowels in word initial or word medial position</td>
<td>está difícil, adoración</td>
</tr>
<tr>
<td>/VrV/</td>
<td>Voiced alveolar flap in intervocalic position</td>
<td>aro, cara</td>
</tr>
<tr>
<td>/VnV/</td>
<td>Voiced palatal nasal in intervocalic position</td>
<td>año, añejo</td>
</tr>
<tr>
<td>/V # V/</td>
<td>Mid/low word boundary hiatus resolution</td>
<td>Ando arriba, proyecto educativo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No L1 equivalents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>/V(#)pV/</td>
<td>Voiceless bilabial stop between vowels in word initial and word medial position</td>
</tr>
<tr>
<td>/V(#)xV/</td>
<td>Voiceless velar fricative between vowels in word initial and word medial position</td>
</tr>
<tr>
<td>/V(#)rV/</td>
<td>Voiced alveolar trill between vowels in word initial and word medial position</td>
</tr>
<tr>
<td>/Ct/</td>
<td>Consonant flap clusters is all syllabic onset position</td>
</tr>
</tbody>
</table>

Table 3.6 Nine linguistic phenomena tested in the present study

The (#) symbol in Table 18 indicates a word boundary. Note, however, that this does not indicate absolute word initial position where there is a pause before the word initial sound. The objective is to indicate that the target item in word initial position in this context is produced in free flowing speech without any pauses and thus without any extra emphasis associated with absolute word boundary position (e.g. Nesport & Vogel, 1986).

It must also be mentioned that suprasegmental phenomena were not figured into the analysis. That is, there was no distinction drawn between target items that occurred in stressed syllables and those that occurred in unstressed syllables. Since the main focus of the study is to observe phonological phenomena, the effect of the stress pattern does not figure as prominently.
than it would in a purely phonetic study, i.e. the duration of a spirantized /ʃ/, may be longer in
duration in certain position. However, its presence in a stressed syllable does not determine if it
is spirantized or not. That is, spirantization occurs in stressed and unstressed syllables alike.

For the sake of quantification the present study does conduct a series of phonetic
measurements such as target item duration, VOT, and intensity. It must be made clear, however,
that the phonetic component is not meant to serve as an analysis in and of itself, but simply as a
manner in which to quantify any broad differences between the variables of gender, and
frequency of Spanish usage. The results from the phonetic analysis are also compared with
available Spanish baselines for the same sounds to answer specific questions, e.g. is the duration
of /p/ similar to that in the speech of a native Spanish speaker? A true phonetic analysis of EGS
would have to be carried out separately and would be remiss without taking factors such as stress
and sentential intonation into account. This however, is material for a separate investigation.

3.3.1 Phenomena with equivalents or near equivalents in the L1

3.3.1.1 Context 1: /V(#)ʃV/

3.3.1.1.1 Spanish

One of the most distinctive characteristics of Spanish stops is found in the production of /ʃ/
which is produced as a result of the contact between the apex of the tongue and the back of the
front teeth. Spanish /ʃ/ is produced with minimal opening of the glottis resulting in a significantly
reduced voice onset time. It must be noted that this dental feature of Spanish is not distinctive
and thus substitution of this sound with the more common alveolar articulation would only result
in a foreign sounding accent as opposed to altering the meaning of words. The voiceless dental
stop is typically not found in word final position in Spanish.
Although the dental character of the Spanish /t/ is not distinctive, it may still be represented in a feature geometrical framework through the [distributed] place feature, meaning that maximum contact between the passive and active articulators is made, i.e. a greater region of the tongue tip surface makes contact and then approximates a dental articulation. This representation is given in (1).

(2) Spanish /t/

The feature tree in (2) illustrates the structure of the Spanish /t/ by including the active place feature, [dist], under the coronal place node. Although /t/ is voiceless it does not aspirate and thus does not have a positive [spread glottis] feature.

There are no specific phonological rules that apply to /t/ in Spanish phonology in the context under investigation in the present study.

3.3.1.1.2 Fang

In Fang, /t/ is produced with alveolar articulation and occurs with about the same frequency as it does in Spanish, according to the figures in Table 16. Unfortunately, phonetic descriptions
of Fang stops are not available in the literature to make a reliable assessment of the lag or lead time of this segment. In order to gain some insight into the acoustics of Fang, some spectrographic information was observed by the researcher which is shown in Figure 3.2 below.

![Spectrographs](image)

Figure 3.2 Spectrograph is aspirated /t/ in Fang

The spectrographs in Figure 3.2 show the production of the word [bốt] “to dress” (3.2a) as produced in absolute word final position. An example of /t/ in onset position is represented by the word [été] (3.2b). As can be observed in absolute word final position /t/ appears to exhibit a significant degree of aspiration. In word-medial intervocalic position, on the other hand, the aspiration appears significantly reduced, though not totally absent as a burst of air is evident in the spectrograph. Though aspiration in Fang does not appear to be as salient as it is in English, for example, it is significantly more than one expects in Spanish, and the production of /t/ with this degree of aspiration is divergent from the Spanish norm.
Since the passive articulator for Fang /t/ is the alveolar ridge and there is a presence of aspiration, the representation in the features of this sound is slightly different from the Spanish dental counterpart. Consider the feature tree in (3).

(3)

It is important to note that aspiration is not distinctive in Fang, and thus the meanings of words do not change according to whether aspiration is present or not. In (3) the [SG] feature is active in the Laryngeal node and it stands for Spread Glottis. This means that the glottis is in a spread position beyond the width necessary for producing a voiceless sound. Note the absence of [dist] feature receives a negative value as the Fang /t/ is produced with less surface context.

As reported in Bibang Oyee rules of lenition, voicing, and deletion are reported to occur in Fang. However, a rule of lenition applies when /t/ occurs in word final position before another word that begins in a voiceless consonant or in the case of voicing, or before a nasal sonorant. Since this context is not being tested in the present study we are only concerned with the proper articulation of /t/ in syllabic onset position.
The variable affrication rule in Fang, however, may affect how native Fang speakers produce the intervocalic /t/ in Spanish. This rule is shown in (4).

(4) /t/ → [ts] / __ [i,e,u]

When assessing this rule it is obvious to see how it could be translated to L2 speech since there are many words in Spanish that include /t/ followed by a high or front mid vowel. However, this rule is quite variable in the L1 according to Medjo Mvé and is no produced with a high degree of predictability.

(5) /x/ → [tsi]

In (5) the /t/ is converted into [ts] as a result of the acquisition of the dorsal place of articulation from the /t/ as a result of assimilation. Note there is no change in the [cont] feature of the /t/ as the affricate is considered as having this feature. The dorsal contact is made with the
palate to produce affrication. Only the necessary feature specifications for the vowel are illustrated.

### 3.3.1.3 Contrasts

<table>
<thead>
<tr>
<th></th>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish /ʎ/</td>
<td>Dental place of articulation, [dist]</td>
<td>None</td>
</tr>
<tr>
<td>Fang /t/</td>
<td>Alveolar place of articulation, [-dist], aspiration [SG]</td>
<td>Possible affrication</td>
</tr>
</tbody>
</table>

Table 3.7 Contrasts between Spanish and Fang /N(#)W/ 

#### 3.3.1.2 Context 2: /V(#)ðV/

#### 3.3.1.2.1 Spanish

The voiced dental stop in Spanish is produced with the blade of the tongue pressed against the back of the top front incisors, identical to the voiceless dental stop. Unlike the other stops, /ð/ has a more extensive distribution that spans word initial, medial and word final positions. Like /b/, /ð/ is also produced with a significantly long VOT of 80+ msec. (Rosner et al., 2000).

In the context that the voiced dental stop is being reviewed in the present study the spirantization rule must be taken into account. This rule is illustrated in (6) below.

\[
(6) \  /ð/ \rightarrow [ð] / [cont] __ [cont]
\]

The rule in (6) states that /ð/ becomes [ð] when occurring between two continuant sounds. This rule is active in all dialects of Spanish throughout the world and is an essential part of the
phonological rule system (e.g. Hualde, 2005). A feature geometrical representation of this rule is given in (7).

(7)

In (7) only the active features for carrying out the process for spreading of the [continuant] feature are highlighted. As can be observed the [cont] feature belonging to the O-Cavity node of the first root spreads to the O-Cavity node of the second root, which upon receiving the [cont] feature drops its feature of [-cont]. It must be noted that the [voice] feature of the laryngeal node of the first root in (7) is receives a ‘α’ feature specification given that the spirantization rule is still active with or without voicing for this segment. However, since spirantization is most commonly associated with voiced stops in Spanish, the [voice] feature of the second node in the sequence must not be negative.

3.3.1.2.2 Fang

In Fang, this sound is produced with alveolar articulation much like the English /d/. It is important to note here that the sound is not dental and is not distributed when making contact with the alveolar ridge.
A feature geometrical description of the Fang /d/ is given in (8).

(8)

\[
\begin{array}{c}
/\chi/ \\
\text{[cons]} \\
\text{[son]} \\
\hline
\text{L} \\
\text{O-Cavity} \\
[\text{voice}] \\
[-\text{SG}] \\
[-\text{cont}] \\
\text{C-PL} \\
\text{COR} \\
[\text{ant}] \\
[\text{dist}] \\
\end{array}
\]

In the feature geometrical sense Fang /d/ is virtually identical to Fang /t/ with the only difference between them being the [voice] and [-SG] features associated with /d/. In Fang the articulation of /d/ is alveolar and thus does not have a [distributed] feature assigned to the coronal node. Also, since /d/ is voiced the [voice] feature and the [-SG] features are assigned to the Laryngeal node.

Fang does not have the spirantization associated with Spanish and typically maintains the complete integrity of this sound during speech between any manner of consonants. There is a native phonological rule of affrication that applies to Fang /d/ which is given in (9) below.

(9) /d/ → [dz] / __ [i, u]
The rule in (9) states that when a /d/ occurs before a high front or back vowel it is affricated to [dz]. In terms of feature geometry, this rule is identical to the one expressed in (9), but with the exception of the voiced laryngeal features for /d/. It must be emphasized that this rule, as was the case with /t/ affrication, is highly variable according to Medjo Mvé and does not occur with predictability in all speakers. Because of this variation the present study will be more focused on how Fang speakers deal with the Spanish spirantization rule, rather than if the variable Fang L1 rule of affrication applies.

3.3.1.2.3 Contrasts

<table>
<thead>
<tr>
<th>Spanish /ɾ/</th>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental place of articulation, [dist]</td>
<td>Spirantization in [cont] __ context</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fang /d/</th>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alveolar place of articulation, [-dist]</td>
<td>Possible affrication, no spirantization rule</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.8 Contrasts between Spanish and Fang /V(#)ɾV/

3.3.1.3 Context 3: /VɾV/

3.3.1.3.1 Spanish

In Spanish this sound is described as a voiced alveolar flap and occurs in word medial position as well as in word final position. It may occur in onsets as well as in codas in word medial position. In standard Spanish it is common for this sound to neutralize to a trill when produced as a coda in word medial position as well as when produced in absolute word final position. It is common for the flap to occur as a member of complex onsets of the type /Cɾ/. The illustration in (10) below shows a feature geometric description of /ɾ/.

93
What distinguishes the /ɾ/ from the other liquid sonorants, e.g. /l/, is the [-lateral] manner feature assigned to the O-Cavity node. Without this feature the feature geometrical representation of /l/ and the /ɾ/ would be identical. The feature geometrical representation is also similar to the alveolar nasal, however, no specification is necessary for nasality in the manner features due to the fact that [continuant] is present, and no nasal sonorants possess this feature.

There are no phonological rules that apply to the alveolar flap in Spanish when occurring between two vowels as is the tested context for the present study.

### 3.3.1.3.2 Fang

Like Spanish the /ɾ/ is described as a *voiced alveolar flap* in Fang and has a very similar distribution to that of Spanish. For example, it may occur in word medial position as well as in word final position. It may occur as an onset or a coda in word medial position but it never occurs tautosyllabically. There is a systematic phonological deletion rule in Fang that effaces /ɾ/ when occurring in word final position before another word that begins in a stop consonant. However, since this study is reviewing the flap in intervocalic position no phonological rule
transfer is expected to occur. It is assumed from the information available on the Fang /ɾ/ that it has the same categorical feature representation as that in (10) for Spanish.

In Lipski and Granda there were no variations reported for EGS /ɾ/. In Quilis & Casado Fresnillo, the flap was replaced by the trill and the palatal glide. However, these rules are not attested in Fang L1 and essentially would not apply in a contrastive analysis.

3.3.1.3.3 Contrasts

There are no apparent differences between Spanish and Fang /ɾ/ as attested in the intervocalic context. From the information available on the /ɾ/ for both languages, they are featurally identical.

3.3.1.4 Context 4: /VɲV/

3.3.1.4.1 Spanish

To produce this sound in Spanish the dorsum of the tongue is raised to make contact with the palate while the velum is opened. Although the main point of articulation is that of the dorsum and the palate the tongue actually makes light contact with a wide area of the top of the mouth. The apex of the tongue is curled down making contact with the back of the front lower incisors.

(11)
In feature tree in (11) the laryngeal node has been underspecified for ease of illustration. Since the segment in question is both [sonorant] and [nasal], it is obvious that the laryngeal specification is voiced.

The distribution of the palatal nasal in Spanish is generally confined to word internal position. Although there are certain uncommon words that begin with the palatal nasal, e.g. ñoño “nerd”, ñáñaras “the jitters” etc. they are few and far between. There are no words in Spanish that end with the palatal nasal. In Spanish, the /ɲ/ is the least common nasal sound as far as unique lexical item distribution is concerned. However, it does occur in several commonly occurring words such as año, baño, caño etc.

### 3.3.1.4.2 Fang

As mentioned in Bibang Oyee (1990), the palatal nasal in Fang is articulatorily identical to the palatal nasal in Spanish. Both are said to make use of the same articulators and of the same and are executed in the same manner.

Unlike Spanish the distribution of the palatal nasal in Fang is slightly different in that it occurs in word initial and word final position where it is generally unattested in Spanish. In word medial position it only occurs as a single segment onset and never in clusters of any kind.

As is the case in Spanish there are no associated phonological rules that apply to the palatal nasal in Fang.

### 3.3.1.4.3 Contrasts
The major difference between Spanish and Fang /ɲ/ is the distribution of this sound in both languages. The /ɲ/ may occur in all positions in Fang but only in word medial position in Spanish.

3.3.1.5 Context 5: /V[-high] # V[-high]/

3.3.1.5.1 Spanish

Spanish has a wide variety of potential word boundary hiatus contexts. In the present study however only the contexts which occur between the low and mid front and back vowels are analyzed, i.e. /e # o/, /o # e/, /o # a/, /a # o/, /a # e/, /e # a/.

Because vowels that stand in hiatus are judged to be marked languages with these sequences typically incorporate strategies for their repair (e.g. Casali, 1997). In Spanish word boundary hiatus is typically resolved through diphthong formation and deletion. Some examples are given in (12).

(12)

a) Deletion of V1: /la # edad/ - > [le.ðad]

b) Deletion of V2: /la # edad/ - > [la.ðad]

c) Diphthong formation: /la # edad/ - > [laj.ðad]

In Spanish there is no definite rule as to which vowel of the sequence is deleted. Mostly, this is a question of dialect or determined by some other variable such as gender, level of schooling etc.
As each vowel sound carries with it a syllable, the deletion and diphthongization of the two vowels results in syllabic loss. (13a-b) illustrates syllabic loss though the hiatus resolution strategies of deletion and diphthongization.

(13)

a) deletion

\[
\begin{array}{c}
\sigma \\
V1 \\
# \\
V2 \\
\rightarrow \\
\sigma \\
V2
\end{array}
\]

b) Diphthongization

\[
\begin{array}{c}
\sigma \\
/o/ \\
# \\
/a/ \\
\rightarrow \\
\sigma \\
[w] \\
# \\
[a] \\
\rightarrow \\
\sigma \\
[wa]
\end{array}
\]

(13b) does not include the moraic weight of the syllable which is typically represented by the ‘\( \mu \)’ symbol in the literature (Roca & Johnson, 1999; Nuñez Cedeño & Morales-Front, 1999). Although the syllable is lost, the mora, or timing element of the syllable is transferred over to the diphthong as shown in (14).

(14)

\[
\begin{array}{c}
\mu \\
/o/ \\
# \\
/a/ \\
\rightarrow \\
\mu \\
[w] \\
# \\
[a] \\
\rightarrow \\
\mu \\
[wa]
\end{array}
\]
The resulting form in (14) is the [wa] diphthong that possesses the glide [w] and the vowel [a]. The force that amalgamates these two sounds is the loss of the syllabicity of /o/. The resulting vowel nucleus considered as complex when compared to nucleic borne out of a single segment. The main difference with the nucleus in (14) is that it has two moraic bearing units which contributes to its complexity.

3.3.1.5.2 Fang

Resolving hiatus in Fang is somewhat different than in Spanish, though no more complex. Although high vowels are prohibited from occurring in word initial position it is common for words to begin with a mid or low vowel. The most commonly attested word boundary hiatus sequences in Fang are /o # e/ and /o # a/. Medjo Mvé reports that when these sequences occur within the word the norm is for the left vowel to undergo glide formation, e.g. /koan/ -> [kwan] “meet up”, /ndzoe/ -> [ndzwe] “boss”. However, when formed at word boundaries, hiatus is resolved through deletion of V1.

(15) a. medza # m/é # o/tugu -> medza m[ó]tugu (proper name)
   b. b/á # a/koma -> b[â]koma “him/her with Akoma”
   c. min[a # é] móno -> min[é] mono “this child and you”

This strategy of hiatus resolution can be summarized in a more generalized rule such as the one in (16).

(16) $V_1[-\text{high}] \rightarrow [\emptyset] / \_\_ \_\_ \# V_2 [-\text{high}]$
The rule in (16) states that when there is a hiatus sequence made up of two non high vowels, the first vowel of the sequence is deleted. In cases where deletion takes place, it is assumed that its corresponding mora is deleted also.

### 3.3.1.5.3 Contrasts

<table>
<thead>
<tr>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish /V[-high] # V[-high]/</td>
<td>Flexible pattern</td>
</tr>
<tr>
<td>Fang /V[-high] # V[-high]/</td>
<td>Generally /o # e/, /o # a/</td>
</tr>
</tbody>
</table>

Table 3.9 Differences in word boundary hiatus resolution between Spanish and Fang

### 3.3.2 Phenomena without equivalents in the L1

#### 3.3.2.1 Context 6: /V(#)pV/

#### 3.3.2.1.1 Spanish

The Spanish voiceless bilabial stop is produced much like its counterparts in the rest of the Romance languages; with short lag VOT, meaning that there is very little spreading of the glottis as the articulation of /p/ is released before voicing of the following voiced segment. Contrastively, other languages such as English produce /p/ with a spread glottis in certain contexts allowing a significant amount of released air to escape before the onset of voicing. The Spanish /p/ is limited to word initial and word medial position. In word medial position it may occur in coda position in words such as apto. A structural description if /p/ is given in (16)
Because Spanish /p/ is not heavily aspirated, the [spread glottis] has a negative specification. There are no phonological rules applied to /p/ that would result in allophonic variation in the intervocalic context being reviewed.

### 3.3.2.1.2 Fang

In Fang there is some disagreement as to whether /p/ can be counted as a consonantal phoneme. Bibang Oyee (1990) states that /p/ is found exclusively in words of foreign origin and when encountered speakers sometimes substitute it with [f]. In Medjo Mvé (1997) /p/ is described as not occurring as a phoneme of Fang, but as an allophone of /b/ when /b/ occurs in word final position.

Since Fang is considered not to be a native phoneme of the language we have to assume that there is no lexical representation on which to illustrate a description. In Bibang Oyee /p/ is said to be produced as either [b] or [f] when pronounced in foreign loan words. The illustration in (17) exhibits the featural change necessary for production as [b].
Simply put, the contrast in sounds in (17) is controlled within the laryngeal category. That is, instead of producing the /p/ with a [-voice] feature, it is produced with a [voice] feature, /b/, which represents one of the closest native phonemes in terms of distinctive features.

In the case of the transformation from /p/ to [f], the Laryngeal features remain identical, but the manner features become responsible for the change as shown in (18).

(17)

\[
\begin{array}{c}
\text{/p/} \\
\text{\hspace{1cm}} \\
\text{L} \\
\text{\hspace{1cm}} \\
\text{[-voice]} \\
\end{array} \rightarrow \begin{array}{c}
\text{/b/} \\
\text{\hspace{1cm}} \\
\text{L} \\
\text{\hspace{1cm}} \\
\text{[voice]} \\
\end{array} \rightarrow \begin{array}{c}
\text{[b]} \\
\end{array}
\]

(18)

\[
\begin{array}{c}
\text{/p/} \\
\text{\hspace{1cm}} \\
\text{O-Cavity} \\
\text{\hspace{1cm}} \\
\text{[-cont]} \\
\end{array} \rightarrow \begin{array}{c}
\text{/f/} \\
\text{\hspace{1cm}} \\
\text{O-Cavity} \\
\text{\hspace{1cm}} \\
\text{[cont]} \\
\end{array} \rightarrow \begin{array}{c}
\text{[f]} \\
\end{array}
\]

(17) and (18) illustrate that native Fang speakers make a choice between the laryngeal feature of voicing in the case of /p/ \rightarrow [b] or the manner feature of continuity in the case of /p/ \rightarrow [f]. However, there is still much work to be done on the status of /p/ in Fang.
3.3.2.1.3 Contrasts

<table>
<thead>
<tr>
<th></th>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish /V(#)pV/</td>
<td>Short lag</td>
<td>None</td>
</tr>
<tr>
<td>Fang /V(#)pV/</td>
<td>Unknown</td>
<td>/p/ -&gt; [b]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>/p/ -&gt; [f]</td>
</tr>
</tbody>
</table>

Table 3.10 Contrasts between Spanish and Fang /p/

3.3.2.2 Context 7: /V(#)xV/

3.3.2.2.1 Spanish

The voiceless velar fricative /x/ is produced with the dorsum of the tongue slightly pressed against the velum. Air is then passed through the narrow groove of the two articulators to generate frication. Theoretically /x/ may occur in word initial, word medial as well as word final positions. In the orthography /x/ is represented by /j/ and /g/. However, it is only represented by /g/ when this sound precedes front vowels, e.g. gesto /xesťo/, gente /xente/, gira /xira/, egipto /exipto/ etc. (19) provides a featural description of the velar fricative.

(19)
Note that the C-Place features for the velar fricative are [high] and [back]. This essentially distinguishes this fricative sound from other similar ones such as /s/. These two place features refer to the position of the back part of the tongue as being in a high position approximating the soft palate. Air is passed through the minimal opening between the articulators as high degree of frication is generated. The [high] feature for the /x/ phoneme also distinguishes it from the uvular counterpart /χ/ as associated with the central peninsular dialect.

3.3.2.2.2 Fang

Fang does not possess a voiceless velar fricative. The closest sound in the native inventory is the voiceless velar stop /k/. Quilis & Casado-Fresnillo report productions of k, the zero allophone, and /h/ as allophonic variations in EGS. However, their participant pool was not homogenous and these realizations could have been influenced by a number of L1s. In Granda (1985), which only used Fang L1s as participants, the allophonic variation was reported as [Ø] and [h]. The latter, though perceptually similar, is actually quite distinct featurally than /x/. For example, /h/ is produced with a spread glottis and has no active articulator, i.e. the tongue is not involved in the articulation.

3.3.2.3 Contrasts

<table>
<thead>
<tr>
<th></th>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish /V(#)xV/</td>
<td>voiceless velar fricative</td>
<td>None</td>
</tr>
<tr>
<td>Fang /V(#)xV/</td>
<td>Closest sound: /k/</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 3.11 Differences between Spanish and Fang /V(#)xV/

3.3.2.3 Context 8: /VrV/

3.3.2.3.1 Spanish

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The alveolar trill is produced with the same place specifications as the alveolar flap. What differs in the production of these two segments, however, is the time in which the tongue is pressed against the passive articulator. Instead of retracting after making contact, the trill remains in place with the relaxed apex of the tongue making repetitive strikes. The apex itself is not generating the energy for the tapping action. This comes from a combination of the tension in the base of the tongue and the rapid air flow that agitates the flaccid tongue blade. The spectrographs in Figure 3.3 below illustrate the difference between the single strike of the flap and the multiple strikes of the alveolar trill.

![Spectrograms](image)

Figure 3.3 Contrast between [ɾ] and [ɾ]

The alveolar trill occurs phonemically in word initial and word medial position. In Spanish the word medial trill is indicated graphically by the double ‘rr’ in words such as perro and word initially as ‘r.’ The trill is in contrastive distribution with the flap in word medial position but never in word initial position. This observation has lead some researchers to believe that word initial trills are simply flaps that become trills in this position to enhance perceptual salience (e.g. Lindau, 1985; Zygis, 2004).
The representation in (20) shows a feature geometrical description of the alveolar trill. However, the trill and the flap are identical in the feature geometrical description in (20). What is missing from the representation is an element that exhibits how the tongue gesture is held in one place for a more extensive amount of time than for the flap. Since Articulatory Phonology has the time element built into its architecture, this is probably a better framework to use for exhibiting the differences between the flap and the trill.

---

16 The feature similarity between /r/ and /ɾ/ is discussed at length in Wiese (2001).
17 This is somewhat of a controversial proposal as AP exhibits phonetic representations of sounds, and not categorical ones. Following such a proposal would place the production of /ɾ/ at the phonology/phonetics interface.
In Figure 3.4 the gestural score shows the relative time of the alveolar flap produced in the intervocalic position in the Spanish preposition *para* as produced by a female native speaker. The TT gesture that generates the flap is approximately 15 msec. in length. The specification for the TT gesture is closed alveolar. However, as emphasized in Browman & Goldstein (1992), the flap does not achieve complete closure and thus the “reduced” specification is added to the gestural description.

In order to compare the differences in gesture hold time Figure 3.5 presents a spectrograph and a gestural score for the word *parra* (vine) in Spanish as spoken by the same native speaker.
Figure 3.5 Gestural score for the alveolar trill [r]

In Figure 3.5 the alveolar gesture is held for a substantially longer time than the alveolar gesture for the flap in Figure 3.5. In this particular case it is almost ten times as long with a duration of 111 msec.

Like the simple alveolar flap, the alveolar trill is also quite resistant to allophonic variation in standard peninsular Spanish. In fact, there are no significant observations to make about the alveolar trill in this dialect for the specific context under inspection.

3.3.2.3.2 Fang

The alveolar trill does not exist in the phonemic inventory of Fang and according to Bibang Oyee and Medjo Mvé it does not exist as an allophone of the flap either. The closest sound in
the Fang consonantal inventory is the alveolar flap /ɾ/. In fact, in Granda, Lipski, and Quilis &
Casado-Fresnillo, the flap was the most preferred replacement phoneme for the trill.

### 3.3.2.3.3 Contrasts

<table>
<thead>
<tr>
<th></th>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish /V(#)rV/</td>
<td>Voiced alveolar trill</td>
<td>None</td>
</tr>
<tr>
<td>Fang /V(#)rV/</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 3.12 Differences between Spanish and Fang /V(#)rV/  

### 3.3.2.4 Context 9: /Cɾ/

Before delving into the detail of /Cɾ/ clusters it is helpful to give a brief description of the
syllable types that are available in both languages. Since these clusters serve as syllabic onsets it
is helpful to understand what constructs are allowed in this position, as well as how the syllable
structure is characterized in the language in general.

### 3.3.2.4.1 Spanish syllable structure

Table 3.13 illustrates the syllable structures of Spanish.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>/ma.ma/</td>
</tr>
<tr>
<td>CVC</td>
<td>/don.de/</td>
</tr>
<tr>
<td>VC</td>
<td>/al.ma/</td>
</tr>
<tr>
<td>V</td>
<td>/a.le.grí.a/</td>
</tr>
<tr>
<td>CCV</td>
<td>/bra.θo/</td>
</tr>
<tr>
<td>CCVC</td>
<td>/tran.bí.a/</td>
</tr>
<tr>
<td>CCVCC</td>
<td>/trans.por.te/</td>
</tr>
</tbody>
</table>

Table 3.13 Spanish syllable structure
3.3.2.4.2 Onsets

Onsets in Spanish may be composed of a single consonant or a maximum of two consonants. In single consonant onsets all 19 consonantal segments are allowed to occur. However, in word initial position the alveolar flap /ɾ/ is prohibited and the palatal nasal is very uncommon, e.g. ñapa. When two consonants are present in the onset only /d/ and /l/ may occur in second position, i.e. C2. The C1 position is limited to stops and the labiodentals fricative. When /l/ is the C2 the C1 may not be /ð/ or /ȳ/, i.e. there are no /dl/ and /tl/ onsets in Spanish. These restrictions for branching onsets also hold true for word medial position.

3.3.2.4.3 Nucleus

The nucleus of the syllable in Spanish may consist of a single vowel, a diphthong or a triphthong. The most common nuclei are single vowels and diphthongs. High and mid vowels that occur next to more sonorant vowels diphthongize, e.g. /ie/ -> [je], unless they are separated by word stress or spoken with a high degree of emphasis. When a high vowel occurs next to another high vowel, the vowel on the left typically diphthongizes, e.g. /iu/ -> [ju].

Triphthongs in Spanish are formed when a low central or the mid front vowels are flanked by either /i/ or /u/ which then become high glides. More specifically, the four diphthongs in Spanish are [wej], [jej],[waj] and [jaj], e.g. [bwej] “ox,” [bjejɾa] “scallop,” [guajɾa] “flute,” [kambjájs] “you all change”. Triphthongs, like diphthongs, may also occur across word boundaries and can involve mid vowels that undergo diphthongization.

3.3.2.4.4 Coda

---

18 This is not true for certain dialects of American Spanish. For example, /tl/ is a common onset for Nahuatl loans in Mexican Spanish, e.g. Tlahuac, chipotle etc.
When compared to the number of segments allowed to occur in Spanish onsets, the restrictive nature of the coda position becomes apparent, especially in word final position. The consonants that may occur in codas both word-finally and word-medially are: /l/, /ɾ/, /n/, /s/, /θ/, /d/. Other consonants that may occur in the coda only in word medial position are: /m/, /k/, /b/, /p/, /f/, and /g/, e.g. *ampolleta, acta, abnegar, apto, aftosa, magnífico*. Of these, /f/ is the least frequent and only occurs in a few words.

Although complex codas are not characteristic of Spanish syllable structure, /Cs/ coda constructs are commonly attested in word medial position. However, the consonant occurring before the coda final /s/ is limited to /l/, /ɾ/, /n/, /b/, /p/, /θ/, /k/, e.g. *transcurso, perspective, abstener* etc.

### 3.3.2.4.5 Resyllabification

In connected speech underlying syllable structures tend to change due to word boundary phenomena. For example, if a word ends in a consonant and the adjacent word begins with a vowel the word final consonant can become the onset of that word. This is shown in (21) below.

(21) /por # e.ta.pas/(CVC # VCVCV) -> [po.re.ta.pas] (CV.CV.CV.CVC)

In (21) the word final /ɾ/ becomes the onset of the following onsetless syllable represented by /e/. Another example may include resyllabification due to diphthongization as shown in (22).

(22) /la # in fla.si.on/(CV # VC.CCV.CV.VC) -> [lajn fla.sjon](CVC.CCV.CVC)
The illustration in (22) shows two examples of single nucleus formation as a result of diphthong formation stemming from one of the vowels in the sequence becoming a glide. The first one is the transformation of V2 in the /a # i/ sequence at the word boundary, /a # i/ → [aj]. The second one takes place within the word with /i # o/ becoming [jo]. In word boundary sequences that involve glide formation and the phoneme /a/ and another vowel, the other vowel will undergo glide formation as there is no glide equivalent for /a/ and it is also the strongest vowel in terms of sonorance.

3.3.2.4.6 Fang syllable structure

The syllable structures of Spanish and Fang are quite similar in that they both prefer CV syllables and limit complexity in onset and coda positions. However, there are some basic differences that could result in difficulties for L1 speakers of Fang. Table 3.14 below shows the syllable structures in Fang.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>bá</td>
</tr>
<tr>
<td>CVC</td>
<td>Kin</td>
</tr>
<tr>
<td>CV:</td>
<td>káá</td>
</tr>
<tr>
<td>CV:C</td>
<td>yaan</td>
</tr>
<tr>
<td>CCV</td>
<td>kwan</td>
</tr>
<tr>
<td>N</td>
<td>m-iná</td>
</tr>
<tr>
<td>V</td>
<td>Abam</td>
</tr>
</tbody>
</table>

Table 3.14 Fang syllable structure

Table 3.15 below shows the syllable structure of the most common word types in Fang as described in Medjo Mvé (1997).

<table>
<thead>
<tr>
<th>Types</th>
<th>Percentage</th>
</tr>
</thead>
</table>

112
Table 3.15 Syllable structure of most common words in Fang

<table>
<thead>
<tr>
<th>-CV</th>
<th>12.61%</th>
</tr>
</thead>
<tbody>
<tr>
<td>-CV:</td>
<td>10.08%</td>
</tr>
<tr>
<td>-C1VC2</td>
<td>47.41%</td>
</tr>
<tr>
<td>-CV1V2(n)</td>
<td>3.27%</td>
</tr>
<tr>
<td>-CV1CV2(n)</td>
<td>18.78%</td>
</tr>
<tr>
<td>-CV1CV2CV3(n)</td>
<td>2.14%</td>
</tr>
<tr>
<td>Others</td>
<td>5.67%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

As can be observed in Table 3.15, CVC is the most common word structure in Fang followed by CVCCV(n). The ‘(n)’ means that the vowel may result in the articulation of a velar nasal, i.e. the vowel is phonemically nasal. The dash preceding each syllable type means that each form can receive a prefix. It can be determined from Table 3.15 that complex onsets in Fang are very rare as they do not figure in the top 93.23% of the most common word types. It is also important to note that Table 3.15 represents commonality of the syllabic structure in word types and not frequency of the syllable type.

3.3.2.4.7 Onsets

The onset in word initial position in Fang can be occupied by all consonant sounds except the velar nasal /ŋ/ and the voiced velar stop /g/. As was mentioned in earlier sections, the velar nasal only occurs with a preceding nasalized vowel and the voiced velar stop is thought to be an allophone of /k/.

The complex onsets of Fang consist of a consonantal segment followed by any one of the two glides /w/ or /j/. There are no complex onsets in Fang where the second member is a liquid consonant as is widely attested in Spanish.
### 3.3.2.4.8 Nucleus

All members of the Fang vowel inventory may serve as syllable nuclei. Like in Spanish when a high vowel occurs before a vowel of more resonance a diphthong is formed by changing the high vowel into a glide. In Fang, there are no contexts where high vowels occur in succession, i.e. */iu/, */ui/, unless they occur next to a long version of themselves. For example /i/ cannot occur next to /i/, but it may occur next to /iː/ which is represented orthographically as “ii.” Thus, it is not impossible to see sequences such as /iiː/ and /uuː/.

### 3.3.2.4.9 Coda

The consonants that are allowed word finally in Fang are also attested in coda position within the word domain. However, codas are far less attested in word medial position. Complex codas are strictly prohibited in both word medial and word final position. The sounds that may occur in Fang codas include the entire nasal inventory /m/, /n/, /ɲ/, /ŋ/, the voiceless stop consonants /p/, /t/, /k/, the voiceless alveolar fricative /s/ and the liquid sonorants /ɾ/ and /l/. The voiceless glottal stop is also said to occur in some word final contexts typically as an allophone of /k/ (Bibang Oyee, 1990).

A frequency count was performed on the lexical entries provided in the appendix of Bibang Oyee (1990) to observe which consonant segments were most commonly attested in Fang in word final position. The results are given in Table 3.16.

<table>
<thead>
<tr>
<th>Word final segment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>/n/</td>
<td>22%</td>
</tr>
<tr>
<td>/m/</td>
<td>17.4%</td>
</tr>
<tr>
<td>/ŋ/</td>
<td>16.7%</td>
</tr>
<tr>
<td>/k/</td>
<td>14.3%</td>
</tr>
</tbody>
</table>
Another frequency count was performed on Spanish to determine which consonants were most common in word final position. The data used for this count was a 6+ million word corpus of newspaper articles known as the “gigaword corpus.” The results are shown in Table 3.17 below.

<table>
<thead>
<tr>
<th>Word final segment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>/s/</td>
<td>39%</td>
</tr>
<tr>
<td>/n/</td>
<td>26%</td>
</tr>
<tr>
<td>/l/</td>
<td>20%</td>
</tr>
<tr>
<td>/t/</td>
<td>11%</td>
</tr>
<tr>
<td>/d/</td>
<td>2%</td>
</tr>
<tr>
<td>/y/</td>
<td>1%</td>
</tr>
<tr>
<td>/z/</td>
<td>1%</td>
</tr>
</tbody>
</table>

Table 3.17 Frequency of Spanish word final segments

The numbers in Tables 3.16-3.17 indicate that four of the ten word final consonants that may occur in Fang are attested in Spanish. These are /n/, /l/, /s/ and /t/. For native Fang speakers /s/, /t/ and /l/ account for only six percent of all word final contexts in the language. The codas that occur in Spanish but not in Fang are /y/, /θ/ and /d/.

3.3.2.4.10 Spanish /Cr/
As was seen in the description of Spanish syllables, /consonant + flap/ clusters constitute the only complex onsets in the language\(^{19}\). In previous studies these sequences have been described as having some degree of vocalic material between them upon production, i.e. [C\(\text{\'}\)r].

Traditionally, the presence of this vocalic material has been referred to as the *svarabhakti* vowel (e.g. Quilis, 1970; Bradley, 2004) and in the majority of cases was thought to show sufficient vocalic characteristics so as to act as a syllable bearing unit. Other analyses view the *svarabhakti* vowel as the result of glottal pulsations that emerge between consonantal articulation, i.e. it is produced during the offset of the first vowel and the onset of the following (Schmeiser, 2006). Figure 3.6 is the gestural score used by Schmeiser (126) to show how the gestures interact together to produce the excrescent vowel.

\[ [\text{k} \quad \text{\'r} \quad \text{V}] \]

**TONGUE TIP**

**TONGUE BODY**

**GLOTTIS**

Figure 3.6 Gestural score for /Cr/ clusters with excrescent vowels

In Figure 3.6 the gestural score exhibits how the overlap between the velar tongue body gesture and the subsequent gestures needed to produce the following vowel result in the

\(^{19}\) Save for CG onsets is words such as tiene -> [tje.ne]. However, this depends on how one would prove the glide is actually a member of the onset or a member of the nucleus.
production of the excrescent vowel. In native speakers this vowel is considered as excrescent as it is highly variable and does not exhibit syllabic characteristics.

In Waltmunson (2005) native English speakers were tested on /Cɾ/ onsets both in word initial and word medial position and it was found that experienced learners of Spanish showed very similar acoustic measurements to native speakers in terms of cluster length and the duration of the excrescent vowel, which was considerably shorter for lower levels. The beginning levels, however, showed a much shorter vowel, which indicated that learners tend to acquire more nativelike gestural timing and coordination along the continuum of study.

In the present study there is no predetermined sequence of /Cɾ/ cluster. However, the possibilities in the Spanish are /bɾ, kɾ, dɾ, fɾ, gɾ, pɾ, tr/.

3.3.2.4.11 Fang /Cɾ/

The only types of branching onsets in Fang are those which consist of a consonant before a glide. There are no syllables in the language that begin with the /Cɾ/ construct. There are words that end in consonants and others that begin in flaps, setting up a potential /Cɾ/ cluster. However, Fang typically deletes word final consonants when followed by any type of voiced sound across word boundaries. It is possible that deletion of the word final consonant is incorporated precisely to prevent these clusters from occurring.

In previous studies on EGS /Cɾ/ clusters were not observed specifically, but only commented on when documenting the behavior of the alveolar flap. This was observed more in Quilis & Casado-Fresnillo than in Granda or Lipski. The observation was that EGS speakers either deleted one of the consonants of the cluster or produced the cluster with a syllabic epenthetic vowel. In cases of deletion it was noted that C1 was usually the consonant to get effaced but the flap was
not immune to this process. It was also noted that a large number of /Cr/ clusters were produced accurately, but there are no precise numbers provided.

3.3.2.4.12 Contrasts

<table>
<thead>
<tr>
<th>Structural</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish /V(#)CrV/</td>
<td>/Cr/ -&gt; [C̃r]</td>
</tr>
<tr>
<td>Structure depends on cluster in</td>
<td></td>
</tr>
<tr>
<td>question</td>
<td></td>
</tr>
<tr>
<td>Fang /V(#)CrV/</td>
<td>NA</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 30. Differences between Spanish and Fang /Cr/ clusters

3.4 Hypotheses

The following hypotheses are based on the traditional tenets of the CAH, i.e. the structure of the L1, and on the results reported in previous EGS studies. They are also divided into two groups; those with apparent L1 equivalents or near L1 equivalents and those without. For example, the /d/ exists in the phonemic inventories of both languages but in Spanish it has dental articulation and in Fang its articulation is alveolar. This qualifies as a near equivalent in Fang.

Where consonant clusters are concerned, i.e. /Cr/, there are indeed L1 equivalents but the phonotactics of these equivalents are distinct in the L2. These items are organized under the non-equivalent L1 sounds category of the hypotheses even though the individual sounds, or near equivalents, may occur in both languages, i.e. /b/ occurs in Fang as well as /d/, but they never occur tautosyllabically.

In cases where the outcome is unknown due to the fact that there is no L1 equivalent, it is assumed that the degree of universal markedness of the L2 item as well as results from previous studies will thus influence how the hypothesis is formulated.
The hypotheses developed to accommodate items that are present in the L1 and the L2 are based on the grammars available for the L1. For example, although both Fang and Spanish both have voiced stops, it is hypothesized that native Fang speakers will not produce them as fricatives in the L2 in contexts where they occur between continuants, i.e. /d/ will not become [ð].

### 3.4.1 Items with L1 equivalents or near L1 equivalents

1. Native Fang speakers will produce the majority of Spanish /t/’s with alveolar articulation, aspiration.\(^{20}\)

2. Native Fang speakers will produce the majority of Spanish /d/’s between continuants as a voiced alveolar stop.

3. Native Fang speakers will produce the majority of Spanish voiced alveolar taps ‘/ɾ/’ with nativelike precision.

4. Native speakers of Fang will produce the majority of Spanish palatal nasals ‘/ɲ/’ with nativelike precision.

5. Native speakers of Fang will resolve the majority cases of Spanish word boundary hiatus by deleting the V1 of the vocalic pair

### 3.4.2 Items without L1 equivalents or near L1 equivalents

6. Native speakers of Fang will produce the majority of Spanish voiceless bilabial stops ‘/p/’ as either the voiced bilabial stop [b] or the voiceless labio-dental fricative [ɾ].

7. Native speakers of Fang will produce the majority of Spanish voiceless velar fricatives ‘/χ/’ as either a voiced velar fricative [ɣ], a voiced velar stop [g], or a voiceless glottal continuant [h].

8. Native speakers of Fang will produce the majority of Spanish trills ‘/ɾ/’ as an alveolar flap ‘/ɾ/’.

9. Native speakers of Fang will produce the majority of Spanish branching onsets of the type /Ct/ in word initial and word medial positions with deletion of one of the onset members.

\(^{20}\) Note that affrication for /t/ and /d/ has been excluded from the hypotheses. This decision was made based on the information available in Medjo Mvé who stated that this phenomenon was not widespread.
The following chapter describes the details of the methods utilized for the data collection of the present study.
Chapter 4

4. Methods

4.1 Participants

The participants for the present study consisted of 15 individuals whose L1 is Fang and whose L2 is Spanish\textsuperscript{21}. The stipulation for participation was to have learned Fang in the home before learning Spanish. Participants were recruited through the Centro Cultural Español (CCE) in the city of Bata on the mainland of Equatorial Guinea and their age groups ranged from 18 to 65. Most of the recruits were either employees or students at the CCE, or attendees of the many social events and classes that the center sponsors on a daily basis. Details of the participants are given in the Table 4.1 below.

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Profession</th>
<th>Gender</th>
<th>Age exposure</th>
<th>Birthplace</th>
<th>Usage Span/Fang</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>31</td>
<td>Teacher</td>
<td>F</td>
<td>9</td>
<td>Urban</td>
<td>50/50</td>
</tr>
<tr>
<td>P2</td>
<td>18</td>
<td>Student</td>
<td>F</td>
<td>5</td>
<td>Urban</td>
<td>75/25</td>
</tr>
<tr>
<td>P3</td>
<td>34</td>
<td>School director</td>
<td>M</td>
<td>9</td>
<td>Rural</td>
<td>50/50</td>
</tr>
<tr>
<td>P4</td>
<td>40</td>
<td>Maintenance worker</td>
<td>F</td>
<td>8</td>
<td>Rural</td>
<td>25/75</td>
</tr>
<tr>
<td>P5</td>
<td>36</td>
<td>Priest</td>
<td>M</td>
<td>8</td>
<td>Rural</td>
<td>50/50</td>
</tr>
<tr>
<td>P6</td>
<td>65</td>
<td>Retail sales</td>
<td>M</td>
<td>10</td>
<td>Rural</td>
<td>25/75</td>
</tr>
<tr>
<td>P7</td>
<td>34</td>
<td>Teacher</td>
<td>M</td>
<td>10</td>
<td>Rural</td>
<td>50/50</td>
</tr>
<tr>
<td>P8</td>
<td>19</td>
<td>Student</td>
<td>M</td>
<td>5</td>
<td>Urban</td>
<td>75/25</td>
</tr>
<tr>
<td>P9</td>
<td>22</td>
<td>Student</td>
<td>M</td>
<td>5</td>
<td>Urban</td>
<td>75/25</td>
</tr>
<tr>
<td>P10</td>
<td>41</td>
<td>Maintenance worker</td>
<td>F</td>
<td>10</td>
<td>Rural</td>
<td>25/75</td>
</tr>
<tr>
<td>P11</td>
<td>46</td>
<td>School program director</td>
<td>F</td>
<td>9</td>
<td>Urban</td>
<td>50/50</td>
</tr>
<tr>
<td>P12</td>
<td>34</td>
<td>Teacher</td>
<td>M</td>
<td>10</td>
<td>Rural</td>
<td>50/50</td>
</tr>
<tr>
<td>P13</td>
<td>46</td>
<td>Maintenance manager</td>
<td>M</td>
<td>12</td>
<td>Rural</td>
<td>25/75</td>
</tr>
<tr>
<td>P14</td>
<td>19</td>
<td>Student</td>
<td>M</td>
<td>5</td>
<td>Urban</td>
<td>75/25</td>
</tr>
</tbody>
</table>

\textsuperscript{21} The majority of the participants also spoke French as an L3 though proficiency levels varied.
Table 4.1 Participants in the study

<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Gender</th>
<th>Occupation</th>
<th>Rural</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>P15</td>
<td>45</td>
<td>F</td>
<td>Maintenance worker</td>
<td>Rural</td>
<td>50/75</td>
</tr>
</tbody>
</table>

As can be seen from Table 4.1 the majority of participants were male. Most of the participants were formally exposed to Spanish upon their first contact with a scholastic environment. For those who were born in rural areas (this category encompasses all of the small towns in the countryside) exposure is somewhat later than those born in urban areas (Bata and its surrounding barrios). All of the younger participants were born in an urban environment and thus had earlier contact with a scholastic environment than those born in the countryside.

Participants were asked to rank their usage of Spanish on a 1/4 scale with Spanish as the numerator. For example, if they used it half the time they would say 50/50. Since all participants use Spanish to some extent during their daily lives, the lowest classification was 25/75 which represents significantly more Fang usage. As shown in Table 4.1 most participants use Spanish either most or half of the time. Spanish is typically used in the professional/scholastic domains whereas Fang is used in the domains of the home and in social settings. However, it must be noted that native Fang speakers would rather carry out business in Fang than in Spanish and this language is generally the most widely used on the streets of Bata. It is also important to note that many of the participants have some working knowledge of French as this is the official language of the surrounding countries of Cameroon and Gabon. It is also used to accommodate many of the newly arrived immigrants from these countries seeking economic opportunity in Equatorial
Guinea as part of the president’s plan announced in May of 2007 entitled *Horizonte 2020* which promises economic prosperity for residents by the year 2020\textsuperscript{22}.

**4.2 Procedures**

**4.2.1 Recording**

The language data for the present study was gathered through face to face participant interviews. In each encounter the participant was taken to a sound attenuated area either within the CCE or in their private homes or workplaces. The participant was fitted with a headset microphone which was connected to a computer nearby. There was significant slack in the microphone for the participant to move freely, i.e. sway back and forth, look around, make hand gestures etc. as though they were speaking naturally without the headset. Before beginning each interview participants were fully informed of the objectives of the study.

Each interview lasted between 20 and 45 minutes and followed general topic guidelines resulting in approximately 7.5 hours of recordings. Participants were initially asked about the general area, the country and asked to elaborate on cultural aspects of the country such as language, food, industry, tourist attractions and activities. In situation where the participant did not produce sufficient spoken discourse through free flowing conversation, a series of pictures (see Appendix 1) were shown and they were asked to talk about the scenes in each\textsuperscript{23}. This typically got the participant speaking again and awakened subsequent topics for further free flowing conversation.

\textsuperscript{22} More can be read about Horizonte 2020 at http://www.africaинфomarket.org/Guinea_Ecuatorial/Plan_20Nacional_20de_20Desarollo_20Economico_202007-1.pdf

\textsuperscript{23} It was later brought to the attention of the researcher by one of the participants that the pictures in the picture reading tasks were difficult to interpret as they reflected Anglo-Saxon culture scenes. Sometimes it was necessary for participants to review some of the pictures before narrating the scene.
4.2.2 Transcription
Each recorded conversation was then saved in mp3 format on the computer with an anonymous name for each participant file. Each participant’s spoken production was then transcribed into plain text format using Transcriber 1.5.1 Software; the utilization of which facilitated the transcription process as it allows for spontaneous listening and writing capabilities. No specific format was used in the transcription other than to specify when participants made pauses and gestures. Each line was written as an utterance and a new one started with each pause. The transcription was done in a standard language and did not take phonetic variation into account. For example, if a speaker produced the word *perro* instead of *pero*, the transcription was generated as the latter. This was done to standardize the text of the corpus in order to facilitate subsequent analysis.

4.2.3 Tagging
Once the transcriptions were completed, the resulting corpus was marked with informal XML tags to highlight each linguistic target item in the study. For example, to specify the Spanish trilled /r/ a “<trill></trill>” set of tags was placed around all words that began with grapheme “r” or included the double “rr,” e.g. <trill>rio</trill> or <trill>perro</trill>. The sole purpose for the utilization of the XML style tags was to make it visually possible to encounter the target item and distinguish it from the others. Since the analysis was conducted on free flowing speech the tagging was essential in order to work in a systematic fashion as nine different targets were examined. Each individual item was analyzed but the tagging mechanism made it possible to reduce the number of items overlooked. The tagging process was carried out electronically through the use of a PERL (Programming Extraction and Reporting Language) tagging script.
(see Appendix 2) carried out in the Windows shell. As to be expected there was some over
generation in the results but these were easily ignored during the actual analysis.

4.2.4 Analysis

Once a tagged version of each participant’s interview was ready, the language analysis was
carried out. This procedure involved reading through the text of the participant while listening to
the accompanying sound file of the same text. Once a tag indicated that a linguistic target item
was encountered its specific characteristics were recorded in an MS Excel spreadsheet. However,
not all items that were tagged in the corpus qualified as potential candidates. Since the speech
was free flowing, it was essential to tease out any extralinguistic features such as delays,
unnatural pauses, fast/slow speech, and low voice volume. The ideal speech speed was a casual
conversational pace in order to conduct as clear and precise phonological and acoustic analyses
as possible. This was achieved, for the most part, by making sure the participant had ample time
to participate and was not in a rush to finish. The pace of the interviewer was also relaxed and
produced at a normal speaking rate.

The specific phonetic and phonological characteristics for each target item are given in
Table 4.2 below.

<table>
<thead>
<tr>
<th>Target item</th>
<th>Phonetic</th>
<th>Phonological</th>
</tr>
</thead>
<tbody>
<tr>
<td>/V(#)pV/</td>
<td>Length, VOT</td>
<td>Voice, substitution</td>
</tr>
<tr>
<td>/V(#)tV/</td>
<td>Length, VOT</td>
<td>Voice</td>
</tr>
<tr>
<td>/V(#)dV/</td>
<td>Length</td>
<td>Voice, Frication</td>
</tr>
<tr>
<td>/Ct/</td>
<td>Length of cluster, length of excrescent</td>
<td>Deletion, substitution</td>
</tr>
</tbody>
</table>

24 The interviewer was the researcher. Although he is a native English speaker, he has received a score of DLI 5/5 in
the Spoken Spanish exam.
The VOT stands for the Voice Onset Time and it is a measure of duration from the time the articulators are released to the time the vocal chords begin to vibrate to accommodate the following sound; which in this study was a vowel. This measurement was only taken for the two voiceless stops under inspection. VOT was not included in the analysis of /d/ because this consonant was analyzed in the intervocalic position. In Spanish, for example, these sounds would not appear as voiced stops but as voiced fricatives/approximates.

As duration of articulation contributes to the ease in which consonants are perceived (Repp, 1984), this variable was thought to be of extreme importance as learners of an L2 may be more inclined to generate L2 sounds with greater articulatory emphasis than those of the L1.

In total, 10 of each target item was extracted and utilized for analysis. This gave a total of 90 target items per participant per sound, and a total of 1,350 items across all participants. However, since two phonetic characteristics were measured for some items, a total of 1,950 items were submitted to phonetic analysis.

The specific number 10 was selected because of the often low proportion of high to low frequency target items in the recorded speech. For example, participants produced a far greater number of /t/s than /ɲ/s due to the fact that there are more words in Spanish that include /t/ than /ɲ/ or /ɾ/ etc. In some cases the production of the low frequency items totaled very close to the minimum number with 11 or 12 productions. It is important to note that repeated words were counted as separate items as well. So if a participant produced the word ‘años’ four times in the

<table>
<thead>
<tr>
<th>Target</th>
<th>Dimension</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>/VrV/</td>
<td>Length</td>
<td>Substitution, lenition</td>
</tr>
<tr>
<td>/V(#)rV/</td>
<td>Length</td>
<td>Substitution, fortition</td>
</tr>
<tr>
<td>/V # V/</td>
<td>Length</td>
<td>Resolution method</td>
</tr>
<tr>
<td>/V(#)xV/</td>
<td>Length, Intensity</td>
<td>Voicing</td>
</tr>
<tr>
<td>/VɲV/</td>
<td>Length</td>
<td>Deletion, substitution</td>
</tr>
</tbody>
</table>

Table 4.2 Target items and their contexts
discourse, it was counted as four distinct productions of /ɲ/. Again, in several cases if it were not for repetitions of specific words, the minimum of the low frequency items would not have been met in the speech of all participants. All acoustic phonetic analyses were conducted in Praat acoustic analysis software.

Each acoustic measurement for each sound was analyzed using two separate groups of independent variables. These were gender and frequency of usage. For the gender category participants were separated into two groups: male and female. No distinction was made for age in the gender group. For the category of usage frequency the participants were divided into reported self-reported usage frequency of the Spanish language in comparison to Fang, the native language. These groups were labeled Low, Medium and High representing 25%, 50% or 75% Spanish usage over Fang. As an unexpected result the variable of usage frequency turned out to be highly correlated with age. For example, those who reported more Spanish usage were all younger and than those who reported less. Additionally, those in the Medium group were younger than those in the Low group.

Descriptive statistics were taken for each dataset and tests of statistical significance were conducted for gender and usage frequency variables. For the variable of gender two sample t-tests were conducted as there were only two independent variables in this category. For the frequency of usage variable single factor ANOVAS were used to discover if there were any significant differences in the data between groups. If differences arose in the ANOVA, two sample t-tests were conducted to discover which groups were significantly different.
Chapter 5

5. Results

The results of this section are organized into two sections: 1) Items with L1 equivalents or near L1 equivalents, and 2) Items without L1 equivalents or near L1 equivalents. As there was both a phonological and phonetic analysis associated with the items under investigation, each section covers the results of the phonological observation and then outlines the results of the phonetic observation which consists of acoustic measurements.

5.2 Items with equivalents or near equivalents in the L1

5.2.1 Context /v(#)tʃv/

It was hypothesized that the voiceless bilabial stop /t/ would not exhibit much variation between the L1 and the L2, since the L1 sound has been described as being very similar to that in the L2 (Bibang Oyee, 1991).

5.2.1.1 Voice

Of the 90 examples of /ʃ/ generated between the two groups, there were no instances of voicing or lenition. The overwhelming tendency was for all participants to produce /ʃ/ with no laryngeal closure and with a highly detectible degree of aspiration.

In addition to aspiration, the Spanish /ʃ/ in Fang was produced as a voiced alveolar stop instead of a voiced dental stop.
5.2.1.2 Duration of /t/

Table 5.1 shows the results for duration of /t/ in intervocalic position.

Table 31.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>96.15</td>
<td>111.95</td>
</tr>
<tr>
<td>SD</td>
<td>20.73</td>
<td>37.6</td>
</tr>
<tr>
<td>Range</td>
<td>96</td>
<td>255</td>
</tr>
</tbody>
</table>

*Table 5.1 duration in msec. of /t/ by gender.*

The data show that the female participants held the articulation of /t/ for a longer period than the male participants. Judging by the standard deviation there also appeared to be more variation in the female group than in the male group. The Range is also quite different between the two groups with female exhibiting 255 msec. and males exhibiting 96 msec..

A two sample t-test revealed that the difference for gender was significant with a p score of .003.

The average duration for the frequency of use groups is given in Table 5.2

<table>
<thead>
<tr>
<th>Group</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>94.38</td>
</tr>
<tr>
<td>Med</td>
<td>94.26</td>
</tr>
<tr>
<td>High</td>
<td>118.46</td>
</tr>
</tbody>
</table>

*Table 5.2 Duration in msec. of /t/ by frequency group.*

There was a substantially higher duration for the high frequency group at 118.46 msec. There was hardly any marked difference between the medium and low frequency groups with 94.26 msec. and 94.38 msec. respectively.
In order to discover if there was any significant difference for the variable of frequency of usage, a single factor ANOVA was conducted for duration. The results of the test revealed no difference for total duration with \( p > .05 \).

### 5.2.1.3 Voice Onset Time

Table 5.3 shows the results for /t/ VOT values in intervocalic position.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>28.41</td>
<td>29.85</td>
<td>29.13</td>
</tr>
<tr>
<td>SD</td>
<td>10.22</td>
<td>13.32</td>
<td>11.77</td>
</tr>
<tr>
<td>Range</td>
<td>54</td>
<td>86</td>
<td>70</td>
</tr>
</tbody>
</table>

*Table 5.3 VOT values in msec. for /t/ by gender.*

The difference in mean duration of VOT for /t/ was not substantial between the two groups, with the males having 28.41 msec. and the females with 29.85 msec. The female group had a slightly higher standard deviation than the males with about a 3 msec. difference. As was seen in /t/ duration, the females also had a wider disparity in Range with a result of 86 msec. whereas the disparity in the males was at 54 msec.

A two sample t-test revealed no significant differences between VOTs of the gender group with \( p = .468 \).

After assessing the differences in VOT between male and female participants, the average VOTs were taken on participants divided into the three groups of Spanish usage frequency; low, medium, high. The results are shown in Table 5.4 below.
<table>
<thead>
<tr>
<th>Group</th>
<th>Average VOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>32</td>
</tr>
<tr>
<td>Med</td>
<td>26.67</td>
</tr>
<tr>
<td>High</td>
<td>31</td>
</tr>
</tbody>
</table>

Table 5.4 VOT in msec. for /t/ by frequency of usage.

The groups with the highest mean VOT were low group with 32 msec. followed closely by the high group with 31 msec. The group with the lowest average VOT was medium with 26.67 msec.

A single factor ANOVA was conducted to discover whether the differences between the three groups were significant. The results revealed that they were significant, $f = 3.89, p = .022$. A two-sample t-test then revealed that there was no significant difference between the low group and medium groups, but between the Low-Med and the High-Med groups. In sum, the medium group produced a significantly shorter VOT for /t/ than the other two groups.

5.2.2 Voiced bilabial stop /v(#)/

The voiced bilabial stop between vowels was hypothesized to show significant deviation from the standard Spanish norm. All of the previous studies on EGS have noted that one of this dialect’s most distinguishing characteristics is the lack of lenition found in the voiced stops when occurring between continuants.

5.2.2.1 Frication of /d/

The data in Table (35) indicate the number of times the /d/ was produced with frication, as a stop, and other; this category consisted of /d/ produced with deletion or as a tap. Since these were substantially less common, there was no distinction between these groups made in the analysis.
The results in Table 5.5 show that the female group tended to produce a higher proportion of their productions of /d/ as full stops (90%). The male group, on the other hand, produced /d/ as a stop 60% of the time and incorporated spirantization at a rate of 33%. The two groups are similar in that they rarely apply other types of variation to this segment, e.g. deletion.

A count was performed to determine whether there was a marked difference in frication of /d/ for Spanish usage, i.e. Low, Medium, and High. The results of this count are shown below.

<table>
<thead>
<tr>
<th></th>
<th>Frication</th>
<th>Non-fric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3 (6%)</td>
<td>47 (94%)</td>
</tr>
<tr>
<td>Medium</td>
<td>15 (30%)</td>
<td>35 (70%)</td>
</tr>
<tr>
<td>High</td>
<td>17 (34%)</td>
<td>33 (66%)</td>
</tr>
</tbody>
</table>

The data in Table 5.6 show that Medium (30%) and High frequency (33%) users of Spanish tend to incorporate frication at a much higher rate than Low frequency users (6%).

### 5.2.2.2 Duration of /d/

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>56.86</td>
<td>62.33</td>
<td>59.59</td>
</tr>
<tr>
<td>SD</td>
<td>33</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>Range</td>
<td>213</td>
<td>112</td>
<td>163</td>
</tr>
</tbody>
</table>

Table 5.7 Duration of /d/ in msec. by gender.
The results in Table 5.7 show that males produced a shorter duration for /d/ at 56.86 msec. The female group, which utilized less frication show a longer duration in the production of /d/ at 62.33 msec.

However, although the results in Table 5.7 show that the males produced /d/ with less duration, the difference between the two genders was not significant as a two tailed t-test revealed a p value of .214, indicating a similarity between the two groups.

In order to discover if there was a significant difference in duration for /d/ based on frequency of use, a single factor ANOVA was conduction on these three groups whose averages are shown in Table 5.8.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>60.42</td>
</tr>
<tr>
<td>Med</td>
<td>55.30</td>
</tr>
<tr>
<td>High</td>
<td>63.04</td>
</tr>
</tbody>
</table>

A single factor AVONA revealed no significant differences between the groups in the frequency of usage category with p > .05.

5.2.3 Alveolar flap /ɾ/  
The Fang alveolar flap has been described by Bibang Oyee as almost identical as its counterpart in Spanish. In fact, Bibang Oyee assures that this sound is not to be challenging for native speakers of Fang producing Spanish as an L2. Thus, the hypotheses predicted that the flap in intervocalic position in the present study would not present much difficulty for the participants and there would be little variation.
5.2.3.1 Variation in flap production

There were a total of four varieties noticed in flap production: flap, deletion, frication, and trilled. However, as shown in Table 5.9 below, the majority of flaps were produced accurately.

<table>
<thead>
<tr>
<th>Variation</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flap</td>
<td>76 (84%)</td>
<td>50 (83%)</td>
</tr>
<tr>
<td>Deletion</td>
<td>1 (1%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Frication</td>
<td>4 (4%)</td>
<td>3 (5%)</td>
</tr>
<tr>
<td>Trilled</td>
<td>9 (10%)</td>
<td>5 (8%)</td>
</tr>
</tbody>
</table>

*Table 5.9 Variation of /ɾ/ by gender*

Flap production for both genders was similar in terms of variation. The majority of both males and females produced the flap with the expected articulation. In many cases the articulation was less defined than in others. However, this minute phonological distinction was not emphasized in the data.

The most widely observed variation was the production of the flap as a trill in intervocalic position. An example is shown in Figure 5.1 below.

![Figure 5.1 Spectrograph of comparison between alveolar flap and trill production](image-url)
In Figure 5.1 the contrast between the alveolar flap and the alveolar flap produced as a trill is displayed. In [muxeres] in Figure 5.1a the flap is produced with a single gesture of the tongue toward the alveolar ridge. In 5.1b, however, the tongue gesture is held in place for a longer period of time and air flow is continuous, resulting in a trill.

The duration analysis for the flap for both genders’ is given in Table 5.10.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>23.74</td>
<td>25.4</td>
</tr>
<tr>
<td>SD</td>
<td>17.57</td>
<td>18.58</td>
</tr>
<tr>
<td>Range</td>
<td>100</td>
<td>84</td>
</tr>
</tbody>
</table>

Table 5.10 Duration in msec. of /ɾ/ by gender

The average duration of flap production was longer in women by about 1.3 msec. The standard deviation was also greater by approximately 1 msec.

There was no statistical difference between the two groups as tested by a two sample t-test of unequal variance, $t = .549$ and $p = .586$.

The average duration of /ɾ/ based on frequency of usage is shown in Table 5.11 for the three categories: low, medium, and high usage.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>25.14</td>
</tr>
<tr>
<td>Med</td>
<td>21.30</td>
</tr>
<tr>
<td>High</td>
<td>26.76</td>
</tr>
</tbody>
</table>

Table 5.11 Duration in msec. of /ɾ/ by frequency group
Although the medium frequency group appears to exhibit a substantially shorter trill than the low and high frequency groups, a single factor ANOVA revealed that the differences in duration were not significant with p > .05.

5.2.4 Palatal nasal /ɲ/

As noted in Bibang Oyee (1991), the palatal nasal sonorant in Fang is identical to the palatal nasal in Spanish, and thus should not be a source of inconsistent production in the L2 in terms of contrastive analysis. However, there was some observed variation in its production. The most notable of which was substitution of /ɲ/ with the palatal nasal glide [j], e.g. /aɲos/ -> [aĵos], and deletion of the sound altogether /nipos/ -> [ni.os].

5.2.4.1 Variation in palatal nasal /ɲ/

As stated above, the most common forms of variation were deletion and substitution of /ɲ/ with [j]. The distribution is shown in Table 41 below.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ɲ/</td>
<td>48(53%)</td>
<td>33(55%)</td>
</tr>
<tr>
<td>Deletion</td>
<td>14(16%)</td>
<td>19(32%)</td>
</tr>
<tr>
<td>Glide</td>
<td>28(31%)</td>
<td>8(13%)</td>
</tr>
</tbody>
</table>

Table 5.12 Variation in /ɲ/ production by gender

As Table 5.12 shows, the majority of both male and female speakers maintained the production of the palatal nasal without any variation. Male participants exhibited more variation in the form of substituting the palatal nasal with palatal nasal glide [j](31%). The female participants, on the other hand, exhibited more variation through the use of deletion with 32%.
Deletion constituted the remaining 16% of male participant variation, and substitution constituted 13% of the remaining variation in female participants.

### 5.2.4.2 Duration of palatal nasals

The duration of the palatal nasal along with standard deviation and mean for the participants in are given in Table 5.13.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>62</td>
<td>87</td>
</tr>
<tr>
<td>SD</td>
<td>21</td>
<td>29</td>
</tr>
<tr>
<td>Range</td>
<td>97</td>
<td>142</td>
</tr>
</tbody>
</table>

*Table 5.13 Duration of /ɲ/ in msec. by gender*

As illustrated in Table 5.13 the male participants produced a shorter palatal nasal with an average duration of 62 msec., as opposed to the duration of the female participants that was 87 msec. The female participants showed higher variation in duration with a standard deviation of 29 msec. and a range of 142 msec. compared to the male participants’ 21 msec. deviation and 97 msec. range.

A two sample t-test showed that the difference in duration of the palatal nasal was significant between the groups with $t = 3.17$ and $p = .002$.

A count was conducted to assess the differences between the frequency of usage groups.

These figures are shown in Table 5.14.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>70.19</td>
</tr>
<tr>
<td>Med</td>
<td>68.24</td>
</tr>
<tr>
<td>High</td>
<td>83.44</td>
</tr>
</tbody>
</table>
Table 5.14 Duration of /ɲ/ in msec. by frequency group

The figures in Table 43 clearly show that the longest duration of /ɲ/ is found the High frequency group with 83.44 msec. The second longest duration is in the Medium group with 68.14 msec. and the shortest duration was 70.19 msec. in the Low frequency group. Despite these disparate figures a single factor ANOVA revealed no significant difference between groups with p > .05.

5.2.5 Word boundary hiatus

In fang it is rare, if not impossible, to see two vowels occur sequentially, except when they occur across word boundaries. In such cases, as noted in Bibang Oyee (1991), the resulting word boundary hiatus is resolved through deletion of the first vowel (V1). In the present analysis it was expected that word boundary hiatus would be resolved in the L2 the same way it is resolved in the L1. However, other strategies to resolve hiatus were observed. Besides V1 deletion the other expected resolution strategies were: V2 deletion and glide formation.

According to Cebrian (2000), it was observed that regardless of the rules that the L1 applies at word boundaries, learners of a second language are more likely to maintain word integrity, i.e. not incorporate phenomena that bind words together phonologically.

5.2.5.1 Variation in hiatus resolution
Since the data collected for the present study was of free flowing natural production, the resulting examples of vowel hiatus were generated by chance, i.e. there was no specific vocalic sequence in mind when conducting the analysis. The criteria for analysis were that the vowel pair had to be a combination of mid and low vowels.

As illustrated in Table 44 the preferred manner of production of word boundary hiatus in EGS was to maintain the vocalic integrity of both lexical items.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiatus</td>
<td>72 (80%)</td>
<td>49 (82%)</td>
</tr>
<tr>
<td>Glide</td>
<td>10 (11%)</td>
<td>4 (7%)</td>
</tr>
<tr>
<td>Delete</td>
<td>5 (6%)</td>
<td>0</td>
</tr>
<tr>
<td>Coalescence</td>
<td>3 (3%)</td>
<td>7 (11%)</td>
</tr>
</tbody>
</table>

*Table 5.15 Variation of hiatus resolution by gender*

The results in Table 5.15 show that there was an overwhelming tendency in both groups to favor hiatus as opposed to implementing a hiatus repair strategy. For males, the preference for maintaining hiatus was 80% and for females it was 82%. The most common resolution strategy for the male group was glide formation (11%) and for the female group it was coalescence (11%). Vowel deletion had a frequency of 6% for males and there were no instances of vowel deletion for female participants. For females there were 4 instances of glide formation resulting in the least attested repair strategy. The least common repair strategy for males was coalescence with a total of three instances (3%).

It must be noted than in the majority of instances of diphthong formation for both groups involved a vowel pair which included the back mid vowel /o/. There were no cases where the front mid vowel resulted in a glide /j/ as attested in various dialects of both peninsular and varieties of American Spanish.
5.2.5.2 Duration of hiatus

The duration of a hiatus that remains unresolved has a greater duration than a resolved hiatus. The present analysis measures duration for unresolved vowel hiatus. These figures are shown in Table 5.16 below.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>169.25</td>
<td>161.28</td>
</tr>
<tr>
<td>SD</td>
<td>67</td>
<td>57.6</td>
</tr>
<tr>
<td>Range</td>
<td>335</td>
<td>279</td>
</tr>
</tbody>
</table>

*Table 5.16 Duration in msec. of hiatus by gender*

The duration of hiatus was slightly longer for men with an average of 169.25 msec. compared to the average of 161.28 msec. for women. There also appeared to be a slightly greater amount of variation in the production of the male participants with an standard deviation of 67 msec. and a range of 335 msec. compared to the female group’s 57.6 msec. and 279 msec. respectively.

In order to discover if there was a statistic difference between the two groups a two tailed t-test was performed that revealed no statistical difference with $t = .69$ and $p = .486$.

The values for duration of hiatus by frequency of usage group is shown in Table 5.17 below

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>174.34</td>
</tr>
<tr>
<td>Med</td>
<td>159.18</td>
</tr>
<tr>
<td>High</td>
<td>121.36*</td>
</tr>
</tbody>
</table>

*Table 5.17 Duration in msec. of hiatus by frequency group*

Although there was no significant difference in hiatus duration for male and female participants, the averages indicated that there would be a substantial difference between
frequency groups with the high group averaging 121.36 msec., the medium group at 159.18 msec., and the low group at 174.34 msec. A single factor ANOVA revealed that the duration for the high frequency of usage group was significant from the Low and Medium groups at p < .05.

When testing for word boundary hiatus in a controlled environment one can predetermine the vowel pairs that will occur across word boundaries through the generation of a laboratory testing instrument. Since the present study collected natural speech, the type of hiatus produced was unpredictable. Table 5.18 below illustrates the most common type of hiatus produced by the two groups of the vowel pairs produced in hiatus.

<table>
<thead>
<tr>
<th>Hiatus Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>/a # e/</td>
<td>28%</td>
</tr>
<tr>
<td>/e # a/</td>
<td>23%</td>
</tr>
<tr>
<td>/o # a/</td>
<td>18%</td>
</tr>
<tr>
<td>/o # e/</td>
<td>33%</td>
</tr>
</tbody>
</table>

Table 5.18 Distribution of hiatus type

To determine whether there was significant difference in duration depending on the type of hiatus, a single factor ANOVA was conducted using type of hiatus as the independent variable, i.e. /a # e/, /e # a/, /o # a/, /o # e/. The results of the ANOVA revealed that the null hypothesis was accepted (F = .138, p = .936) meaning that there were no significant differences in duration depending on the type of word boundary hiatus.

5.3 Items without equivalents or near equivalents in the L1

The following sections report the results of the items that are absent from the L1.
5.3.1 Voiceless bilabial stop /V(#)pV/

Due to the fact that Fang has been described as a p-less language, and due to the results reported in previous studies, it was expected in the hypotheses that /p/ would be difficult for participants to produce. Although /p/ is not considered a native phoneme of Fang, it is used in some loan words as illustrated in Bibang Oyee (1991). When these foreign words are produced in Fang /p/ is produced as /f/ or as the voiced bilabial stop /b/.

The results for /p/ focus mainly on two acoustic measures; length and voice onset timing (VOT). The length was measured from the onset of the articulation to the offset of the VOT at the point of vocal cord vibration of the following vowel. All /p/ phonemes were tested in intervocalic position.

5.3.1.1 Substitution and voicing

It must be noted that out of 150 productions of /p/ there was only one participant that incorporated voicing. This was observed in one of the female participants and the voiced /p/ underwent frication resulting in voiced bilabial fricative [β]. There was not one case of /f/ substitution attested in the data.

5.3.1.2 Duration of /p/

The data in Table 5.20 show the results for the duration of /p/ broken down by gender.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>99.4</td>
<td>113.8</td>
<td>106.6</td>
</tr>
<tr>
<td>SD</td>
<td>2.57</td>
<td>3.23</td>
<td>2.9</td>
</tr>
<tr>
<td>Range</td>
<td>137</td>
<td>127</td>
<td>132</td>
</tr>
</tbody>
</table>

*Table 5.19 Duration in msec. of /p/ by gender*
The results revealed that female participants had a longer duration than male participants for /p/ by approximately 14 msec. The standard deviation for the female group was also slightly higher by some 66 msec. The female participants exhibited a range of 10 msec. lower than the male participants.

A two sample t-test revealed that the difference in duration of /t/ between male and female participants was significant with $t = 3.47$ and $p = .0006$.

The average durations were calculated for /p/ according to frequency of usage. These results are given in Table 5.21.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>120.65*</td>
</tr>
<tr>
<td>Med</td>
<td>99.10</td>
</tr>
<tr>
<td>High</td>
<td>96.60</td>
</tr>
</tbody>
</table>

*Table 5.20 Duration in msec. of /p/ by frequency group

The low frequency group had the largest value for duration at 120.65 msec. followed by the medium frequency group at 99.10 msec. and then the high group at 96.60 msec. An ANOVA test revealed significance between groups with the low group producing a significantly longer segmental duration than the medium and the high groups.

5.3.1.3 Voice Onset Timing

The voice onset timing (VOT) measurement was collected on the spectrogram by marking the interval of time that passes between release of the labial articulators and the onset of full voicing of the following vowel as illustrated in the sonogram in Figure 5.2 below.
Figure 5.2 above represents the sonographic output of [p] and [a] in the phrase *No sé que va pasar* (I don’t know what is going to happen). In this particular case the interval between lip aperture and full voicing onset is approximately 10 msec. In several cases in the data the VOT was so minimal that it was set to 0 msec. in the data collection. As mentioned above there were no cases in the data where the VOT for /p/ exhibited negative VOT which is reflective of voicing. In total 63% of the /p/ productions of the female participants were produced with a VOT greater than 0. This number was similar to the male participants whose /p/ productions had a VOT of greater than 0 at a rate of 66%. The data in Table 5.21 below show the results for VOT by gender.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>20.11</td>
<td>16.43</td>
<td>18.27</td>
</tr>
<tr>
<td>SD</td>
<td>1.75</td>
<td>1.9</td>
<td>1.85</td>
</tr>
<tr>
<td>Range</td>
<td>58</td>
<td>73</td>
<td>65.5</td>
</tr>
</tbody>
</table>

*Table 5.21* VOT of [p] in msec. by gender
The results in Table 5.21 show that the male group produced a longer duration of /p/ than the female group with 20.11 msec. and 16.43 msec. respectively. The standard deviation for the males was slightly lower at 1.75 msec. compared to the females at 1.90 msec.

The averages for VOT duration were taken for frequency of usage; the figures for which are given in Table 5.22.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>19.62</td>
</tr>
<tr>
<td>Med</td>
<td>22.86</td>
</tr>
<tr>
<td>High</td>
<td>13.46*</td>
</tr>
</tbody>
</table>

*Table 5.22 Duration in msec. by frequency group

In Table 5.22 shows that the high frequency of usage group produced the lowest VOT value for /p/ at 13.46 msec. This was followed by the low frequency of usage group at 19.26 msec. and then by the medium group with a value of 22.86 msec. An single factor ANOVA test revealed significance for the high group (p < .05) whereas there was no significance reported between the low and medium groups.

5.3.2 Voiceless velar fricative /V(#)xV/

According to Hualde (2005) the voiceless uvular fricative in Castilian Spanish is quite distinctive for speakers of non-peninsular Spanish as it has somewhat of characteristic ‘hacking’ sound. In Spanish dialects throughout the world this sound has been observed to show a high degree of variation, e.g. produced as /x/ in Mexican and most other American varieties of Spanish, and as /h/ in the Caribbean dialects as well as the dialect spoken in the Canary Islands and Andalusia (Hualde, 2005: 156). Since standard peninsular Spanish has been determined to be
the model followed in Equatorial Guinea, the present study should qualify the target sound as the uvular variety. However, as will be seen below, all participants appear to copy the velar fricative.

5.3.2.1 Voicing, deletion, substitution

Although the Spanish spoken by Fang L1s in Equatorial Guinea incorporates the voiceless velar fricative as observed in Mexican and other American Spanish dialects, i.e. /x/, this sound still represents an entirely new phoneme for Fang L1s. It is also observable that Fang L1 speakers do not replace the voiceless uvular fricative with [h] egregiously, as spectrographic analyses revealed. An example of an [x] and a [h] allophone as produced in the same word are shown in Figure 5.3 below.
Figure 5.3 Spectrograph of turbulence comparison of [x] and [h]

The spectrogram in Figure 5.3 is of a female native Spanish speaker from Mexico and Figure 5.3b was produced by a female Spanish speaker from Equatorial Guinea. In Figure 5.3a the turbulence produced by frication results in a darker color and the formants are more well defined. In Figure 5.3b the formant structure is weaker as is the intensity of frication. Figure 5.3b exhibits more vowel-like resonance than frication.

As noted above the spoken production of EGS by Fang L1s revealed mostly two varieties of the Spanish voiceless velar fricative, the velar fricative [x] and the voiceless aspirate [h]. To a lesser degree there is voicing of the velar fricative resulting in the voice velar fricative common in the Spanish allophonic inventory [ɣ].

<table>
<thead>
<tr>
<th></th>
<th>/x/</th>
<th>/h/</th>
<th>/ɣ/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>74 (82%)</td>
<td>14 (16%)</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Female</td>
<td>42 (70%)</td>
<td>15 (25%)</td>
<td>3 (5%)</td>
</tr>
<tr>
<td>Total</td>
<td>116 (77.3%)</td>
<td>29 (19.3%)</td>
<td>5 (3.3%)</td>
</tr>
</tbody>
</table>

Table 5.23 Variation of /x/ by gender

As seen in Table 5.23, the majority of participants, 77.3%, produced accurate velar fricatives while 19.3% produced debuccalized /h/. A small percent produced voiced velar fricatives, 3.3%. A higher proportion of males produced the velar fricative (83%) and females accurately produced this sound 70% of the time. The female group produced the dubuccalized [h] (25%) more often than men (16%). Both male and female groups exhibited very low production of the voiced velar fricative, 2% and 5% respectively.

The voiceless velar fricative was analyzed on two acoustic measures, length and intensity in decibels. The results of these measures are shown in Table 5.24.
As shown in Table 5.24, there appeared to be very little difference for the variable for gender on both measures. The total average length was 85.11 msec., with male participants producing the sound slightly longer at 88.89 msec. than female participants at 81.32 msec. There was even less observable difference between groups for intensity with men exhibiting 72.56 decibels and women at 72.49 decibels.

A two sample t-test was run for both measures to discover if there were any significant differences for gender. As expected from the descriptive data there was not significant difference for length \( t = 1.69, p = .0925 \). And as was expected for intensity, there also was no significant difference between the groups, \( t = .0913, p = .927 \).

The averages for duration for /x/ for frequency of usage groups are given in Table 5.25.
The group with the greatest number for duration is the low frequency group with an average of 111.55 msec. The medium frequency of usage group had the second longest duration at 96.32 msec. followed by the high group which averaged 95.26 msec. A single factor ANOVA revealed there was a significant difference between the groups (p < .05) and subsequent testing showed that the difference resided in the low group while there was no significant difference found between the Medium and High groups.

The averages for intensity for the frequency of usage groups are given in Table 5.26.

<table>
<thead>
<tr>
<th>Group</th>
<th>Intensity (decibels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>70.93</td>
</tr>
<tr>
<td>Med</td>
<td>71.04</td>
</tr>
<tr>
<td>High</td>
<td>72.89</td>
</tr>
</tbody>
</table>

**Table 5.26** Intensity in decibels of /x/ by frequency group

The averages measures of intensity of /x/ for the categories of Frequency of usage exhibited minor variation. The high frequency of usage group averaged 72.89 decibels while the medium group came out at 71.04 decibels. The Low frequency of usage group had an average intensity of 70.93 decibels. A single factor ANOVA revealed no significant difference for intensity of /x/ between the three groups (p > .05).

### 5.3.3 Trilled alveolar approximate /V(#)rV/

Fang does not have a trilled alveolar approximate in its consonant inventory, nor does it have a contextually defined trill rule for taps. The data for the present study observed trill production in both contexts, word initial where the trill is represented graphically as “ɾ,” e.g. *río*, and word medially where the trill is represented as “rr,” e.g. *carro*.
5.3.3.1 Allophonic variation

The major allophonic variation in the data showed the trill produced as a tap in both of the mentioned contexts. Another variant, though not very common, was the production of the trill as sibilant [ɾ] often seen in word final position in Latin American dialects (e.g. Butragueño, 2005).

Figure 5.4 below illustrates the difference between a the production of a trill and a tap as produced in the word *barrio*.

![Figure 5.4 Spectrograph of trill /ɾ/ produced as flap [ɾ]](image)

Figure 5.4 clearly shows two tongue tip gestures to produce the trill while Figure 5.4b shows one gesture in the neutralization of /ɾ/ to /ɾ/.

In some cases, instead of producing a neutralized trill, participants produced a trill with a degree of overproduction meaning the trill was produced with an excessive number of tongue
gestures uncommon in Spanish dialects\textsuperscript{25}. An example of this type of overtrilling is shown in Figure 5.5.

The example in Figure 5.5 is from a male Equatorial Guinean Fang L1 speaker. The slight exaggeration of the trilled /r/ is noticeable with the series of four distinct tongue gestures.

The figures in Table 5.27 below show the allophonic distribution of /r/ by gender.

Table 5.27.

<table>
<thead>
<tr>
<th></th>
<th>[r]</th>
<th>[r]</th>
<th>[ŋ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>21(23%)</td>
<td>68(76%)</td>
<td>1(1%)</td>
</tr>
<tr>
<td>Female</td>
<td>17(28%)</td>
<td>40(67%)</td>
<td>3(5%)</td>
</tr>
<tr>
<td>Total</td>
<td>38(25%)</td>
<td>108(72%)</td>
<td>4(3%)</td>
</tr>
</tbody>
</table>

\textit{Table 5.27 Variation of /r/ by gender}

\textsuperscript{25} Spanish does make use of over-trilling when showing an excess of emotion in some words. However, the data for trills in the present study did not select target items used enhanced through the expression of high emotional content.
Interestingly, the majority of participants produced the alveolar trill /r/ as an alveolar tap [ɾ] with a total of 72%. This was the case for 76% of the males and 67% of the females. Only 23% of male participants and 28% of female participants produced the trill yielding a total of 25.3% for all participants. Production of the trill as a voiced sibilant was observed in only four cases (3%), three of which occurred in the female group and one in the male group.

Since the alveolar trill occurs in both word initial and word medial position, a test was run to observe whether participants preferred producing the trill in one context and not the other. These results are shown in Table 5.28 below.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>18(29%)</td>
<td>42(69%)</td>
<td>1(2%)</td>
<td>3(10%)</td>
<td>26(90%)</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>15(44%)</td>
<td>16(47%)</td>
<td>3(8%)</td>
<td>3(12%)</td>
<td>23(88%)</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>33(35%)</td>
<td>58(61%)</td>
<td>4(4%)</td>
<td>6(11%)</td>
<td>49(89%)</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 5.28* Variation of /r/ by linguistic context by gender

The numbers in Table 5.28 clearly show that participants appear more likely to produce the tap in both contexts rather than the trilling. The context that is most likely to produce a trill is word initial for both male (29%) and female participants (44%). In this context females are most likely to produce the sound accurately. When it comes to word medial position, it appears that both groups are more likely to produce the trill as a tap with males at 10% accurate production and females at 12%.

### 5.3.3.2 Duration of trills

The only acoustic measure taken for the trill was that of duration. Typically, if the trill was produced correctly the length of the sound was longer than if it had been produced as a tap given
that trills are basically a series of taps. The mean length for trills produced and taps produced for both males and females is given in below.

(1) Mean duration for trills produced as taps: 19.87 msec.
   Mean duration for trills produced as trills: 87.15 msec.

Table 5.29 below shows the duration of the /r/ for male and female participants.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>37.75</td>
<td>48.93</td>
<td>43.34</td>
</tr>
<tr>
<td>SD</td>
<td>35.62</td>
<td>40.28</td>
<td>37.95</td>
</tr>
<tr>
<td>Range</td>
<td>170</td>
<td>173</td>
<td>171.5</td>
</tr>
</tbody>
</table>

Table 5.29 Duration in msec. of /r/ by gender

The total average for both male and female participants was 43.34 msec. Production from female participants was slightly longer with a total average of 48.93 msec. compared to the males at 37.75 msec. The SD was slightly longer for females at 40.28 msec. compared to the male group’s 35.62 msec. Both groups had similar ranges with males at 170 msec. and females at 173 msec.

A two sample t-test was conducted to observe whether the differences between with two groups was significant and the results show that the null hypothesis had to be accepted with $t = -1.63$, $p = .103$.

The results of trill duration for the variable of frequency of Spanish usage are shown in Table 5.30.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>44.62</td>
</tr>
<tr>
<td>Med</td>
<td>39.83</td>
</tr>
<tr>
<td>High</td>
<td>43.15</td>
</tr>
</tbody>
</table>

Table 5.30 Duration of /r/ in msec. by frequency group
From observing the descriptive data in Table 59 the main difference is in the group that uses Spanish 50% of the time. Surprisingly, the group that reports using Spanish more than the L1 is similar to the ‘Low’ group, which reported using Spanish less than Fang. A single factor ANOVA was performed to observe whether there was a significant difference amongst the three groups using the three categories of usage frequency as the independent variable. The results from the ANOVA revealed no significant difference between any of the groups, F = .230, P = .794.

5.3.4 /Cr/ Clusters

The /Cr/ clusters are composed of a consonant and an alveolar flap occurring sequentially as a complex onset. Since the data for the study was gathered through spontaneous speech, no specific cluster was predetermined. Table 5.31 below shows the clusters produced in the data in terms of frequency.

<table>
<thead>
<tr>
<th>/Cr/ Cluster</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>/tɾ/</td>
<td>61 (41%)</td>
</tr>
<tr>
<td>/pɾ/</td>
<td>36 (24%)</td>
</tr>
<tr>
<td>/bɾ/</td>
<td>25 (17%)</td>
</tr>
<tr>
<td>/dɾ/</td>
<td>11 (7%)</td>
</tr>
<tr>
<td>/fɾ/</td>
<td>9 (6%)</td>
</tr>
<tr>
<td>/kɾ/</td>
<td>8 (5%)</td>
</tr>
</tbody>
</table>

Table 5.31 Frequency of /Cr/ clusters

Table 5.31 shows that /tɾ/ is the most frequently occurring /Cr/ cluster in the data with 41%. This is followed by /pɾ/ with 24% and then /bɾ/ with 17%. The least frequent /Cr/ clusters were
/dr/ (7%), /fɾ/ (6%), and /kt/ (5%). The two clusters with voiced stops preceding the alveolar tap were /br/ and /dr/ and were fully articulated as stops and not as voiced continuous approximates, e.g. /br/ -> [br], and not [βr]. All items were analyzed in the intervocalic position and no absolute phrase initial contexts were analyzed.

5.3.4.1 Variation in production of /Ct/

The majority of /Ct/ clusters in the present study were produced with native like accuracy despite the fact that such clusters do not occur in the L1.

A common observation was the transformation of the alveolar flap to an alveolar trill, e.g. /om.bɾe/ -> [om.bre], /rexistra/ -> [re.xis.trə].

The third most common observation of /Ct/ production was deletion of the flap, e.g. /ki.lo.me.tɾos/ -> [ki.lo.me.tos], /prak.ti.ka/ -> [pak.ti.ka].

Table 5.32 shows the frequency of surface variation for /Ct/ clusters in this study.

<table>
<thead>
<tr>
<th>Variation</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>81 (54%)</td>
</tr>
<tr>
<td>Trilled /t/</td>
<td>50 (33%)</td>
</tr>
<tr>
<td>/t/ deletion</td>
<td>19 (13%)</td>
</tr>
</tbody>
</table>

Table 5.32 Variation of /Ct/ clusters

The ‘None’ category listed in Table 5.32 represents near native-like coarticulation of the two segments. In the spectrogram there was a degree of vocalic material between the consonants of these clusters which was considered to be the result of gestural overlap that is also attested in the speech of native speakers.

Table 5.33 shows the breakdown of /Ct/ variation by gender.
<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>50 (55%)</td>
<td>31 (51%)</td>
</tr>
<tr>
<td>Trill</td>
<td>26 (29%)</td>
<td>22 (37%)</td>
</tr>
<tr>
<td>Deletion</td>
<td>14 (16%)</td>
<td>5 (8%)</td>
</tr>
</tbody>
</table>

Table 5.33 Variation of /Cɾ/ clusters by gender

The major differences percentage wise between male and female speakers are found in the use of deletion as a variation of /Cɾ/ clusters which was 100% higher in males. The female participants, on the other hand, had a higher percentage of trills at 37% compared to males at 29%. Males had a higher number of accurately produced clusters at 55% compared to females at 51%

5.3.4.2 Duration of /Cɾ/ clusters

Duration for /Cɾ/ production was measured in msec. from the onset of the consonant articulation to the offset of the flap. Table 5.34 shows /Cɾ/ duration in descriptive detail by gender.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>105.90</td>
<td>122.95</td>
<td>114.42</td>
</tr>
<tr>
<td>SD</td>
<td>36.49</td>
<td>43.75</td>
<td>40.12</td>
</tr>
<tr>
<td>Range</td>
<td>176</td>
<td>196</td>
<td>186</td>
</tr>
</tbody>
</table>

Table 5.34 Duration in msec. of /Cɾ/ clusters by gender

As shown in Table 5.34 female participants produced longer duration for /Cɾ/ clusters at 122.95 msec. compared to male participants which averaged 105.90 msec. The standard deviation and the range were also slightly higher in female participants. A two sample t-test
revealed that the differences in duration of /Ct/ clusters between male and female participants was significant at t = 2.47, p = .014.

Since the descriptive analysis revealed that female participants incorporate more instances of trilling, there may be a tendency for /Ct/ clusters that incorporate trills to be significantly longer. To determine whether this was the case, a two sample t-test was conducted between the duration for /Ct/ clusters incorporating trills and to those produced normally. The results revealed that the difference in duration between these two cluster variants was significant with t = 2.68, p = .008, with the trilled variant being significantly longer.

The averages for /Ct/ duration for frequency of usage are given in Table 5.35.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>119.52</td>
</tr>
<tr>
<td>Med</td>
<td>110.82</td>
</tr>
<tr>
<td>High</td>
<td>108</td>
</tr>
</tbody>
</table>

Table 5.35 Duration in msec. of /Ct/ by frequency group

The high frequency of usage group had the shortest duration for /Ct/ clusters at 108 msec. The Medium usage group had the second highest duration at 110.82 msec. and the longest duration was the Low group at 119.52 msec.

To determine whether frequency of usage of the Spanish language in comparison to the native language had a significant effect on /Ct/ duration, a single factor ANOVA was conducted on the variables of low, medium, and high usage as self-reported by each participant. The results revealed no significant difference for usage frequency, f = 1.20, p = .302.
A common characteristic of /Cr/ production is the excrescent vowel or *svarabhakti* elements that often occur between the two consonants of the sequence. Table 65 shows the duration results of this vocalic element as measured by gender.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>32.32</td>
<td>32.36</td>
<td>32.34</td>
</tr>
<tr>
<td>SD</td>
<td>13.15</td>
<td>12.90</td>
<td>13.03</td>
</tr>
<tr>
<td>Range</td>
<td>70</td>
<td>56</td>
<td>63</td>
</tr>
</tbody>
</table>

*Table 5.36 Duration in msec. of svarabhakti element in /Cr/ clusters by gender*

The averages for the vocalic element for male and female participants were very similar. The males had an average of 32.32 msec. while the females were at 32.36 msec. with hardly any difference between the two. The standard deviation for males was 13.15 msec. and 12.90 for females. The ranges were slightly different with the males at 70 msec. and the females with a range of 56 msec.

A two sample t-test was conducted to discover whether the differences in svarabhakti length were significant between males and female. The results of the t-test revealed no significant difference with $t = 1.65$ and $p = .987$.

The measurements for svarabhakti average length were then taken for frequency usage groups consisting of low, medium and high. These results are shown in Table 65.

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>35.55</td>
</tr>
<tr>
<td>Medium</td>
<td>29.68</td>
</tr>
<tr>
<td>High</td>
<td>43.13</td>
</tr>
</tbody>
</table>

*Table 5.37 Duration of Svarabhakti element by frequency group*
As shown in Table 5.37 the medium group had the lowest duration for the excrescent vowel at 29.68 msec. This was followed by the high usage frequency group at 34.13 msec. and then closely followed by the low group at 35.55 msec. To discover if there were any significant differences between the groups a single factor ANOVA was conducted. The results of the ANOVA revealed that there was no significant difference between the duration of the excrescent vowel across the three groups with $f = 1.56$, $p = .213$.

5.4 Summary

This section has presented the results of the data analysis as phonological and phonetic in nature. Table 5.38 summarizes the findings of the phonological variation, i.e. substitution, deletion etc.

<table>
<thead>
<tr>
<th>Target item</th>
<th>Phonological variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>/V/#tV/</td>
<td>[tʰ]</td>
</tr>
<tr>
<td>/V/#dV/</td>
<td>[d]</td>
</tr>
<tr>
<td>/V_rV/</td>
<td>[ɾ], [ɹ], [ɾ], [Ø]</td>
</tr>
<tr>
<td>/V_pV/</td>
<td>[n], [Ø], [ʃ]</td>
</tr>
<tr>
<td>/V # V/</td>
<td>[V # V], [V # G], [G # V], [V # Ø], [Ø # V]</td>
</tr>
<tr>
<td>/V(#)pV/</td>
<td>[p], [pʰ]</td>
</tr>
<tr>
<td>/V(#)xV/</td>
<td>[x], [h]</td>
</tr>
<tr>
<td>/V(#)rV/</td>
<td>[ɾ], [ɹ], [ɾ]</td>
</tr>
<tr>
<td>/C_r/</td>
<td>[Cr], [Cʰr], [Cr], [CØ]</td>
</tr>
</tbody>
</table>

Table 5.38 Summary of phonological variation

Table 5.39 summarizes the results for the acoustical analyses carried out in the present section. The ‘*’ indicates a significant statistical difference.

<table>
<thead>
<tr>
<th>Target item</th>
<th>Gender</th>
<th>Usage Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>/V(#)tV/</td>
<td>Male</td>
<td>High</td>
</tr>
<tr>
<td>Duration</td>
<td>96.15*</td>
<td>111.95*</td>
</tr>
<tr>
<td>VOT</td>
<td>28.41</td>
<td>29.85</td>
</tr>
<tr>
<td>/V(#)dV/</td>
<td>Female</td>
<td>Mid</td>
</tr>
<tr>
<td>Duration</td>
<td>56.86</td>
<td>62.33</td>
</tr>
<tr>
<td>/V_rV/</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Duration</td>
<td>56.86</td>
<td>62.33</td>
</tr>
</tbody>
</table>

159
<table>
<thead>
<tr>
<th>Duration</th>
<th>23.74</th>
<th>25.40</th>
<th>26.76</th>
<th>21.30</th>
<th>25.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>/VɲV/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>62*</td>
<td>87*</td>
<td>83.44</td>
<td>68.24</td>
<td>70.19</td>
</tr>
<tr>
<td>/V # V/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>169.25</td>
<td>161.28</td>
<td>121.36*</td>
<td>159.18</td>
<td>174.34</td>
</tr>
<tr>
<td>/V(#)pV/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>99.40*</td>
<td>113.80*</td>
<td>96.60</td>
<td>99.10</td>
<td>120.65*</td>
</tr>
<tr>
<td>VOT</td>
<td>20.11</td>
<td>16.43</td>
<td>13.46*</td>
<td>22.86</td>
<td>19.62</td>
</tr>
<tr>
<td>/V(#)xV/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>88.89</td>
<td>81.32</td>
<td>95.26</td>
<td>96.32</td>
<td>111.55*</td>
</tr>
<tr>
<td>Intensity</td>
<td>72.56</td>
<td>72.49</td>
<td>72.89</td>
<td>71.04</td>
<td>70.93</td>
</tr>
<tr>
<td>/V(#)rV/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>37.75</td>
<td>48.93</td>
<td>43.15</td>
<td>39.83</td>
<td>44.62</td>
</tr>
<tr>
<td>/Cɾ/</td>
<td>105.90*</td>
<td>122.95*</td>
<td>108</td>
<td>110.82</td>
<td>119.52</td>
</tr>
<tr>
<td>/C̃ɾ/</td>
<td>32.32</td>
<td>32.36</td>
<td>34.15</td>
<td>29.68</td>
<td>35.55</td>
</tr>
</tbody>
</table>

Table 5.39 Summary of acoustical analyses
Chapter 6

6. Discussion and Conclusion

The present chapter begins by reviewing the hypotheses presented in Chapter 4 and discusses whether they are accepted, rejected or if there simply is not enough information available to draw a conclusion. After presenting the hypotheses a general conclusion is made. Limitations of the present study are highlighted and directions for future research are then given.

6.1 Hypotheses

6.1.1 Hypothesis 1: Native Fang speakers will produce the majority of Spanish /t/s with alveolar articulation and aspiration.

The results of the study show that there is enough evidence to support hypothesis 1 since the majority of participants exhibited /t/ production that is uncharacteristic of dental place of articulation. Particularly convincing was the presence of aspiration. As mentioned in studies such as Abraham and Lisker (1964) and recent studies such as Benkí (2005), Spanish voiceless stops are generally produced with almost simultaneous voicing. In /t/-aspirating languages such as English, on the other hand, aspiration is measured acoustically through VOT. In English VOT is typically 30 msec. and higher and the native Fang speakers in this study produced /t/ in Spanish (in intervocalic position) with a mean of 29 msec., meaning that the VOT found in EGS /t/ is considerably longer, and more characteristically alveolar.

One caveat, however, is that there is not enough fine grained phonetic data on the L1 to clearly state to what degree /t/s are aspirated in Fang. Through listening to spontaneously Spoken
Fang and conducting anecdotal spectrographic analysis, the researcher could detect that there was a highly perceptible degree of aspiration, but no formal experimentation was carried out.

When a language employs phonetically aspirated stops, aspiration is typically transferred to the similar L2 sound, even when the L2 equivalent is unaspirated. A good example of this is the acquisition of Spanish by native English speakers. In this study (Reeder, 1998) English speakers at lower proficiency levels exhibited a high degree of aspiration in the production of L2 /h/. From intermediate to advanced there was less aspiration, but always higher than the native Spanish mean; in this study the means were nearly always twice as long at that recorded by native Spanish speakers. The participants also exhibited wilder variation from shortest to longest VOT while native Spanish speakers exhibit less.

In the present study participants who reported using Spanish and Fang with equal frequency produced the lowest VOT values while those who reported using Spanish at low and high frequencies showed no significant differences in VOT amongst themselves, but did show a significant difference with the medium frequency group.

One explanation for these results could be that some medium frequency speakers use Spanish more efficiently and carefully than users in the high group. For example, one of the participants in the medium group had a Spanish father whom she established a relationship with in her teens and had lived for some time in Madrid, Spain. Another participant works as a Spanish teacher and is very well-versed in the grammar of the language. Although this participant uses Fang to communicate with friends and family, when Spanish is used it is typically done so in a very careful manner.

The results show that speakers prefer to maintain the L1 sound as opposed to the equivalent in the L2. This is an interesting outcome as the plain stops in Spanish are considered as being
less universally marked than the aspirated stops (e.g. Burzio, 2000; Greenberg, 1966; Jakobson & Halle, 1956). The voiceless unaspirated stops, are considered to be more common across the languages of the world and they involve less articulatory manipulation in their production, and are typically acquired by children before the aspirated stops (e.g. Fellbaum, 1986).

Of particular interest is the idea that aspirated /t/ is articulatory more complex than unaspirated /t/. The claim here is that the opening of the glottis that is required to produce aspiration involves more complex muscular activity than the unaspirated stop, which leaves the glottis in neutral position (Keating et al., 1983).

This may tell us that when the sound of the learner’s L1 is more marked than the nearest L2 equivalent, speakers will generally retain the marked sound as if it were impossible to unlearn. This idea is mentioned in Takahashi (1987) in stating that the degree of markedness of the speaker’s L1 is positively correlated to more foreign accent in the L2.

The results also showed that there was a significant difference between the duration of the male and female production of /t/. More specifically, female EGS speakers produce a significantly longer /t/ than their male counterparts. It is important to note that the difference in duration did not lie in the VOT, but in the time in which the articulation for the /t/ was held, i.e. the adduction time of the tongue tip gesture and the passive articulator. The average durations for both groups, however, were considerably shorter than the duration for the /t/ found in native Spanish speakers which is generally averages about 151 msec. (e.g. Soto-Barba & Valdivieso, 1999). This notable difference in duration is potentially caused by the broad distribution of the tongue tip when producing the native Spanish /ʃ/ whose contact is longer as it is more widely distributed across the passive articulator and thus causes the articulation to be held in place for a longer period of time.
In terms of VOT, there was no significant difference in duration for gender. Where there was a significant difference, however, was in the short VOT times for the medium frequency of usage group. This may have been due to the fact that there were two Spanish language teachers within the medium group that had received instruction at a university in Spain. Although the speakers in this group reported less usage, for at least some of them, however, their usage is more nativelike due to the amount and quality of exposure they have had to the L2. Even though this group had the shortest values for VOT they were still some 10 msec longer than the native Spanish norm at approximately 17 msec.

In categorical terms, Fang L1’s failed to acquire the [distributed] features of the coronal node as well as the negative value for [-spread glottis] of the Laryngeal node. A comparison of this is illustrated in (1).

(1)

a) Fang Spanish /t/

b) Standard Spanish /t/
The feature tree in (1a) represents the /t/ in EGS by native Fang speakers. The feature tree in (1b) represents the native target norm. The features that were not acquired by the EGS speaker are highlighted in bold and consist of the Laryngeal specification of negative [spread glottis] and the [distributed] feature.

In terms of phonetics, the results indicate that the native Fang speakers in this study have not acquired the fine grain details of L2 timing for the voiceless dental stop as their measurements for duration were much shorter than the durations for native speakers of peninsular Spanish. In the framework of Articulatory Phonology the disparity in closure times could be the result of an L1 perceptual characteristic that does not interpret segment duration as critical for message interpretation. The most probable interpretation, however, lies in the difference in articulation of /t/ in the two languages. Since native speakers of Fang produce this sound with alveolar articulation and with the [–dist] feature, the contact time of the tongue apex with the passive articulator is much shorter.

As both the phonological and phonetic analyses indicate that the Fang speakers in the present study negatively transfer the L1 phone to the L2, Hypothesis 1 is accepted.

6.1.2 Hypothesis 2: Native Fang speakers will produce the majority of Spanish /d/s between continuants as a voiced alveolar stop

The closest equivalent to the Spanish dental /ð/ in Fang is the alveolar /d/. Hypothesis 2, however, does not focus on the articulatory difference between the two sounds, but on the absence of a the spirantization rule in Fang that exists in Spanish. Broadly stated, the hypothesis
predicted that because the spirantization rule does not exist in Fang, it would not surface in the Spanish of native Fang speakers.

A similar question was presented in Face & Menke (2009) for native English speaking college students studying Spanish as a second language. Their results found that the advanced students incorporated the spirantization rule more than those at lower levels, whose accurate production was less than 35%.

In Zampini (1996), who also tested the spirantization in the L2 production of native English speakers, there was a pattern for learners to first acquire this rule in the basic phonological domains before the more complex ones. This means that learners were able to first acquire spirantization at the syllable boundary within the word, e.g. /kada/ -> [ka.ða], before applying it across word boundaries /ki.e.ro # dar/ -> [kje.ro.ðar]. She found that at the lower levels spirantization was contained mostly within the word at the syllable boundary and at the higher proficiency levels it was found between words and phrases as well.

The results in the present study showed that both male and female participants rarely utilized the spirantization rule. That is, they mostly produced /d/ as an intact voiced alveolar stop with full adduction between the apex of the tongue and the alveolar ridge.

However, although the spirantization rule was rarely used, it was attested in some participants and was more common in males by what appears to be a significant margin (males = 33% and females = 7%). These results differ from those of Quilis & Casado-Fresnillo (1995) by a substantial margin as nearly 60% of /d/s in their study underwent spirantization.26

The difference between the sexes noted in this study could be related to the fact that, although there was one female who had spent time in Spain, more of the male participants had

26 It may be that the notion of an Equatorial Guinean Spanish has become more defined since 1995, and the lack of spirantization is a characteristic that has grown stronger.
direct contact with the culture of the second language than females, i.e. took special courses, and some even have university studies in Spain. As things currently stand in Equatorial Guinea, it is more common for males to study abroad, i.e. typically in Spain, while females are more likely to stay behind and tend to family matters.

When taking frequency of Spanish usage into account, things begin to become clearer as frication was hardly reported for the majority of low frequency users who were slightly older and received less formal education in Spanish. There was only one participant who produced all instances of spirantization with nativelike Spanish accuracy. This particular participant studied in a seminary in Spain for several years, but at the moment reported using Spanish and Fang at about the same frequency.

The group that reported using Spanish more than Fang in their daily lives was composed of younger individuals who were exposed to formal systems of education where Spanish is utilized instead of the native language. In the university setting Fang is simply not an option between colleagues due to the multi-racial and multi-ethnic settings found in these institutions. These participants showed the most instances of spirantization as a group.

In referencing Zampini, the results did not appear to follow a hierarchical pattern of acquisition, though this was not a particular concern of this study. Low levels of spirantization were observed in all speakers across all levels of education (save for one outlier who spirantized across the board). In some cases, participants with university degrees produced less spirantization than those who had received little or no formal education.

In the phonetic analysis the duration of /d/ was measured for gender and for the groups that composed the frequency of usage variable. The results of these tests showed that there was no difference in duration for either set of variables. That is, the duration for /d/ in male and female
speakers was about the same as well as for the low, medium and high groups that made up the frequency of usage variable.

Surprisingly, the duration for this sound produced by the EGS speaking participants was quite similar to the duration for /d/ in native Spanish speakers which is approximately 58 msec. However, this comparison is difficult to draw since the /d/ tested in the present study was measured in intervocalic position whereas the lengths measured in the studies where the baseline figure was taken (e.g. Quilis, 1981; Soto-Barba & Valdivieso, 1999), were measure in absolute word initial position.

In terms of feature analysis it can be said that the participants in the study failed to acquire the [distributed] coronal place feature necessary for producing the nativelike /d/. In accounting for the speakers who did not incorporate spirantization it can be said that they failed to incorporate a postlexical L2 rule that results in the transformation of a stop into an approximant between continuous segments.

(2)

(a) Not acquired

<table>
<thead>
<tr>
<th>Lexical</th>
<th>Postlexical</th>
</tr>
</thead>
<tbody>
<tr>
<td>/d/</td>
<td>[d]</td>
</tr>
<tr>
<td>[-cont] [cont]</td>
<td>[-cont] [cont]</td>
</tr>
</tbody>
</table>

(b) Acquired

<table>
<thead>
<tr>
<th>Lexical</th>
<th>Postlexical</th>
</tr>
</thead>
<tbody>
<tr>
<td>/d/</td>
<td>[θ]</td>
</tr>
<tr>
<td>[-cont] [cont]</td>
<td>[-cont] [cont]</td>
</tr>
</tbody>
</table>
The key in (2) is shown under the Postlexical category in (2b) in the relinquishing of the [-cont] feature and incorporation of the [cont] feature. The retention of the [-cont] feature in (2a) is what Optimality Theorists would term as Faithfulness, meaning that speakers retain the lexical form and prevent it from undergoing any postlexical transformational rules. In the OT framework the constraint that expresses this retention of lexical features is known as ‘Ident [Feature]’ (e.g. Kager, 1999)’ and it appears to be highly ranked in EGS and possibly also highly ranked in the L1.

Taking these observations into account hypothesis 2 can thus be accepted as the results show the majority of Fang L1s did transfer place of articulation and failed to spirantize in most cases. However, the percentage of participants who did incorporate spirantization cannot be totally overlooked.

6.1.3 Hypothesis 3: Native Fang speakers will produce the majority of Spanish voiced alveolar flaps ‘ɾ’ with nativelike precision.

Based on the Fang description presented in Bibang Oyee, there should be no major difference between the alveolar tap in Spanish and Fang. Thus, based on the tenets of the CAH, Hypothesis 3 determines that native speakers of Fang should be able to produce the /ɾ/ in Spanish with near nativelike precision.

In Major (1986) we see that native speakers of English, who do not possess an alveolar flap in their phonemic inventory, exhibit variation in Spanish flap production, e.g. [l] substitution, uvular trills, as well as the uvular fricative [χ].

The flap production of the participants of the present study did not exhibit as much variation as those in Major, but the variation that is observed is interesting to note. The results showed that
both males and females produced the alveolar tap with similar rates of accuracy. The same was also true for the allophonic variants of this phoneme which surfaced as [Ø], [ɾ], and [r]. Of these variants, however, deletion and frication were rare in both groups. However, the trill was produced instead of the tap in 8% of total cases.

The production of a trill instead of a tap could be troublesome for communicative purposes because in some instances the allophonic substitution results in a phonemic distinction, e.g. [karɔ] (expensive) vs. [karɔ] (car, carriage), [perɔ] (but) vs. [perɔ] (dog) etc. However, flap substitution by the trill occurred both in contrasting and non-contrastive contexts, e.g. /era/ (was) -> [era] (no meaning) so the notion that trill formation was the result of lexical substitution can be safely disregarded.

The motivation for producing trills instead of flaps in the intervocalic position could be the result of developmental phonological processes as was observed in Major (1986) and in other studies such as Broselow et al. (1998). For example, as noted in Colina (2009), the trill is preferred to the flap in word initial position and that phonological constraints exist for the prohibition of flaps in coda position. Colina described this constraint as *[ɾ]/onset and is favored for perceptual reasons, i.e. its perceptual markedness is less than the flap /ɾ/. According to descriptions, Fang allows flaps in onset position and does not substitute it or generate a trill in its place. However, as we have seen in works such as Broselow et al., the interlanguage grammars of learners are sometimes unstable and will exhibit a reranking of specific linguistic constraints, resulting in phenomena that are uncharacteristic of the L1 and the L2. Although not extremely common, trilling of flaps was somewhat evenly distributed throughout the participants. In Zygis (2004) a similar phenomenon is described using Boersma’s Principle (1998) which states that
speakers are more likely to overemphasize articulation when placing specific detail on listener-oriented principles, i.e. when perception is emphasized over production.

Also, it cannot be ignored that in peninsular Spanish the flap is often neutralized to a trill in certain positions, i.e. word final and in coda position word medially. In Fang, the production of the trill instead of the flap could be the result of neutralization as an effect of interlanguage. That is, the articulatory coordination for the production of a single flap is unstable in interlanguage and the trill is produced as a part of the Lazy effect described in Kirchner (1997) when the type of neutralization of /ɾ/ that takes place in coda and absolute word final position is found in word medial position.

In Articulatory Phonology this process may be illustrated through gestural overlap. In this case the overlap occurs between the tongue tip and the tongue body with the tongue tip of the flap and the tongue body gesture of the following vowel being executed simultaneously.

![Figure 6.1 Gestural score for /ɾ/ produced as [ᵻ]](image)

In figure 6.1 the word *para* (prep. for) is produced as *parra* (vine) as a result of overlap between the tongue body and the tongue tip gestures. Spectrographic evidence seems to support
this proposal as vocalic formants are visible through the entire length of the trill as illustrated in Figure 6.2.

a) [pero]

b) [pero]

Figure 6.2 Spectrograph of gestural overlap in [pero]

The outcome of the acoustic analysis of /ɾ/ showed no significant differences for this measure for gender or frequency of usage group. The /ɾ/ produced by native Fang speakers showed no real significant differences in length when compared to native speakers (approx 24 msec.) (e.g. Waltmunson, 2005). These similarities in length were not mentioned in the previous studies on EGS and more research is needed to understand the behavior of /ɾ/ in Fang.
Hypothesis 3 is accepted because the majority of /ɾ/ in the L2 were produced as [ɾ] as an account of positive transfer.

6.1.4 Hypothesis 4: Native speakers of Fang will produce the majority of Spanish palatal nasals ‘/ɲ/’ with nativelike precision.

The palatal nasal is found in both consonantal inventories of Fang and Spanish. According to Bibang Oyee (1991) this segment is identical to that of Spanish, and thus should not be difficult for native Fang speakers to produce when speaking Spanish. In Lipski (1985) it was stated that none of the native languages of Equatorial Guinea had the palatal nasal in its inventory. However, as stated above, phonological research on Fang has shown that it definitely is a phoneme of this language and has a wider distribution that in the L2.

As noted in the results section, however, speakers tended to either produce the segment with native-like accuracy or substitute it with a palatal nasal glide [ʃ]. In some instances the palatal nasal was completely effaced.

As was the case for the alveolar flap, variant productions of the palatal nasal in the L2 may be an effect of developmental processes. Keeting & Lahiri (1993) detail the complexity of the palatal nasal by showing how the tongue body and the tongue blade are used to produce a single sound, i.e. there is contact with the tongue blade first, and then with the tongue body. Thus it can be considered that palatal nasals are quite uncommon and more universally marked than other sounds. Additionally, as pointed out in De Lacy (2006), the palatal nasal rarely occurs in word final position or in word initial position. De Lacy also states how the palatal nasal in intervocalic position is often substituted by the nasalized glide, as was observed in the present study.
(3) illustrates how the manner features of [-cont] and the class feature of [cons] of the palatal nasal are effaced and replaced by the manner features of [-cons] and [cont] of the following vowel resulting in the dorsal glide. The nasality of the /ɲ/ is maintained.

In cases where the palatal nasal was produced with nativelike accuracy we can assume that the L1 positively transferred to the L2. However, in cases where /ɲ/ is produced as /j/ we must assume that positive transfer is not occurring and that something else is taking place. Palatal glides are part of the phonemic inventory in Fang and represent the only other palatal consonant and thus under the equivalence classification would be an ideal candidate for its replacement. But then we must answer why speakers wouldn’t try to replace a sound that already exists in their native consonant inventory?

The answer to this observation could reside in the proposals set forth in the Structural Conformity Hypothesis (Eckman, 1991) which states that even universally marked segments that are in the L1 inventory of sounds would still be difficult for learners to master during interlanguage. Since the palatal nasal is universally marked speakers replace it with a less marked yet structurally similar sound, [j].
The phonetic analysis tested the duration of the palatal nasal and found that there was a significant difference for this measure for the gender category with females producing a significantly longer /ɲ/ than males. This may be a feature of the L1 but there is no phonetic data to prove this assumption. Another explanation could be that female participants exhibit hypercorrection in their speech (e.g. Valentin, 2011; Wardaugh, 2011) resulting in longer more carefully produced articulation of sounds. The female speakers (87 msec.), in fact, approximated the lengths for the palatal nasals in native Spanish speakers (90 msec.) more so than the males (62 msec.) by a considerable margin.

Since the majority of palatal nasals were produced as palatal nasals in the L2, Hypothesis 4 is accepted although female participants exhibited more nativelike precision than male participants.

6.1.5 Hypothesis 5: Native speakers of Fang will resolve the majority cases of Spanish word boundary hiatus by deleting the V1 of the vocalic pair.

Vowel sequences within words are extremely infrequent in Fang and typically are only found in foreign loans. The most common type of sequence occurs across word boundaries and consists of mid and low vowels, but may also include high vowels as the V1 because no words in Fang begin in high vowels and thus never render a high /# V2/. In the present study only combinations of mid and low vowels were considered.

According to Bibang Oyee (1991) word boundary hiatus in Fang is systematically resolved by deleting the V2 of the vowel pair or gliding V1 if it is an /o/. In the results of the present study these L1 rules were observed in the L2. However, the majority of vowel sequences in hiatus in
this study were left intact and no resolution strategy was applied. In order to address this
observation we can look to L2 studies such as Cebrian (2000) which suggested that there is a
“word integrity effect” in interlanguages that does not allow unification of sounds across word
boundaries and thus phenomena such as word boundary palatalization or hiatus resolution are
blocked.

The results showed that the word integrity effect is seen as active in the interlanguage of
EGS as the majority of sequences surfaced as separate units. However, since the data were
recorded in the form of free flowing natural language, there was very little reason for speakers to
try to consciously produce each sound separately.

The phonetic analysis that measured duration of /V # V/ sequences revealed no significant
difference for gender but did reveal a significant difference for frequency of usage. In this
measure the high frequency group produced a significantly shorter sequence of vowels than the
medium and low groups. This difference can be motivated by the fact that the participants who
used the L2 more often incorporated more resolution strategies such as deletion and
diphthongization resulting in a shorter vocalic sequence.

Taking into account the high number of cases that were produced in hiatus, hypothesis 5 is
rejected because the majority of hiatus sequences were maintained intact.

6.1.6 Hypothesis 6: Native speakers of Fang will produce the majority of Spanish voiceless
bilabial stops ‘/p/’ as either the voiced bilabial stop [b] or the voiceless labiodental fricative
[f].

Hypothesis 6 is based on the analysis provided in Bibang Oyee (1991) when describing Fang
as a /p/-less language. It was said that native Fang speakers are only exposed to /p/ when it
occurs in foreign loan words. The pattern, as Bibang Oyee explains, is to produce the /p/ either as
[b] or [f]. However, it was emphasized in his analysis that the Okak\textsuperscript{27} dialect typically produces /p/ as [b] and the Ntumi dialect produces it as [f] in most cases.

During an interview with a participant for the present study the researcher asked about the production of /p/ and if it was a very common sound in Fang. The participant’s response confirmed what Bibang Oyee had stated about this phoneme. However, the level of familiarity with this phoneme appeared to be quite high and at first was reticent to say that native Fang words did not include this sound. Thus, the degree of foreignness of /p/ for native Fang speakers is not as great as /x/, for example.

One reason for this may be that the majority of Equatorial Guineans who live in urban areas have had high rates of exposure to other languages besides Spanish that do include /p/. Due to the influx of immigrants and visitors from Gabon and Cameroon, French has also become an important language to learn in order to find a job, especially in the service industry. Although not commonly spoken in Río Muni, most Equatorial Guineans also have some familiarity with the English pidgin from Bioko island known as “Pichi” whose vocabulary is present throughout the entire country, e.g. pepe sup [“spicy soup,” lit. “pepper soup”] is a common dish whose name includes /p/ in three different contexts.

When a phoneme is foreign to a specific language and does not form part of the speakers’ mental lexicon, the speaker may be expected to produce it with a high degree of variability as an acoustical range for it has not be established, e.g. an average length or VOT duration. In Flege as well as in the original proposals of Fries (1947) and Lado (1957), new phonemes were considered to be sometimes easier to accurately acquire than those that have exact or near

\textsuperscript{27} Names of dialects are based on the local tribe system, the Okak and the Ntumi being the most dominant.
equivalents in the L1 as learners are able to forge a new “space” for it over time and not have it distorted by similar L1 sounds.

The results revealed here that EGS speakers produce /p/ in the L2 either very similarly, i.e. with little or no VOT, or as an aspirated voiceless bilabial stop, /ph/, which represented the majority. The closure interval in the production of /p/ was also much longer in EGS speakers than for native Spanish speakers, 106 msec. for the former and approximately 72 msec. for the latter. This shows that EGS speakers hold the lip closure gesture for a significantly longer period of time than native Spanish speakers.

It is interesting to observe that although /p/ is foreign to the native language it is produced in the L2 with a significantly higher degree of VOT than what is observed for native Spanish speakers, which typically average no more than 4 msec. (e.g. Lisker & Abramson, 1964). As far as this researcher knows, there has been very little investigation into how L2 stops are produced by speakers whose L1 does not include these sounds. One would assume that the speaker would intuitively opt to produce the sound in the least marked manner possible and thus show no aspiration. However, it may be the case that if the rest of the sounds belonging to a particular class, e.g. stops, carry aspiration, then newly acquired ones would be carried out in the same manner\textsuperscript{28} if the place of articulation allows\textsuperscript{29}.

\textsuperscript{28} This is simply a conjecture to motivate the results.
\textsuperscript{29} Pharyngeal stops are typically not aspirated.
The structure in (4) illustrates a skeletal framework for voiceless stops in a particular language. In Fang, even though the phoneme is not native, it was produced with aspiration in many cases, thus showing that the class itself may be predesigned to incorporate aspiration due to the presence of the [SP] Laryngeal feature.

The results for /p/ are quite similar to those in Lipski (1985) when he observed that the lack of voicing of this phoneme is maintained in EGS. However, Lipski does not give any indication if /p/ is produced with aspiration. In Quilis & Casado Fresnillo (1995) /p/ was said to be produced as a voiced bilabial approximant [β] in intervocalic position. The present study, however, only observed one instance of this type of pronunciation. Unfortunately, de Granda (1985) does not provide analysis for /p/.

The phonetic analysis for /p/ revealed some significant differences both for duration and VOT for both groups. For example, as we have seen in other sounds within this study, the female participants tend to hold the articulation of the sound for a longer period of time than male participants. This was no different for /p/ which resulted in an average 113.80 msec. for females and 99.40 msec. for males. The frequency of usage category also showed a significant difference for the duration of /p/ where the low frequency group had the longest duration which was
actually a reflection of the longer VOT times, i.e. the greater the aspiration, the longer the total absolute duration of the segment appears to be.

There was also a significant difference in VOT duration for participants who reported using Spanish significantly more than Fang (13.46 msec.) which approximates the native speaker VOT for /p/ of 5 msec., but is still considerably longer. The Medium and the Low groups did not approximate the short Spanish norm. Based on the probability that high frequency users are in more contact with other Spanish speakers, it is not surprising that their productions of /p/ should reflect a more nativelike resemblance.

Based on these data Hypothesis 6 is rejected as there were hardly any productions of [b] and no attested productions of [f]. The majority of speakers produced an aspirated voiceless bilabial stop.

6.1.7 **Hypothesis 7: Native speakers of Fang will produce the majority of Spanish voiceless velar fricatives ‘/χ/’ as either a voiced velar fricative [ɣ], a voiced velar stop [g], or a voiceless glottal continuant [h].**

Before interpreting the results for the velar fricative it must be understood that there was some confusion as to how this sound should have been classified for the present study. According to the previous studies on EGS cited in this thesis EGS has used standard peninsular Spanish as a learning model, thus the present sound should be described as the voiceless uvular fricative /χ/. However, since it appears that EGS tends to follow a mixed model of peninsular Spanish, the present sound was qualified as velar as none of the participants produced the uvular fricative.
If there were any example in which Flege (1995)’s Speech Learning Model would apply in this study, it is with the voiceless velar fricative. As shown in chapter 3 the Fang language does not possess any type of velar fricative and this sound is not attested in any of the other native languages, including French. Thus, the majority of speakers will have first encountered /x/ when learning Spanish.

In Granda (1995) it was observed that the /x/ was either deleted or replaced by /h/. It was also noted, however, that the phoneme was correctly produced in many instances. Lipski (1985) also had similar results as Granda, but did not report consonant elision. The widest range of variability was reported in Quilis & Casado Fresnillo where [k] was included along with several versions of [h].

In the present study participants produced /x/ as [x], [h] or [ɣ]. The overwhelming tendency, however, was to produce the sound with nativelike accuracy, thus showing that new categories with no near L1 equivalents may be created with a high degree of precision compared to those which have near or exact equivalents in the L1.

The second most attested allophone of /x/ was the voiceless glottal continuant [h]. The major difference between these two phones is the closer proximity of the dorsum to the velum creating a higher intensity sound reflected in the waveform as darker noise and formant visibility. Selection of the [h] allophone could be the effect of debuccalization where the place of articulation for the phone is undetermined and only voiceless bandwidth noise is produced. This is reproduced in the feature geometrical illustration in (5) below.
The feature comparison in (5) shows the absence of place specification. It is important to note that Fang does not have /h/ in its phonemic inventory. It is considered here that the marked nature of the velar sound results in debuccalization as a repair strategy considering that dorsals are of the most marked sounds on a universal scale (e.g. De Lacy, 2002). However, the /h/ differs from /x/ in the features class specification for [cons] and for the specifications for the laryngeal features making /h/ an uneconomic substitute for /x/.

To date there has been very little acoustic evidence for native speaker norms on the acoustic properties of the voiceless velar fricative. One available baseline, however, is found in Del Barrio Estevez & Tornel Castells (2001) where native Spanish speakers produced durations for /x/ ranging between 95 and 145 msec. In the present study the lengths were notably shorter averaging 85.11 msec. with a combined standard deviation of approximately 3.10 msec. Being a new sound one would expect the speaker to produce it with hypercorrection. However, a considerable number of the velar fricatives were produced with deccucalization and thus the
measurement of the duration of the consonant may have been skewed\textsuperscript{30}. One exception was surprisingly found in the Low frequency group which produced a relatively long /x/ (approx. 111 msec.) resembling the duration found in native Spanish speakers. Again, this could be owed to the carefully produced oral production of these groups which, in general, tended to speak much slower than the groups that reported more frequent usage.

Another important acoustic measurement performed on the /x/ phoneme was intensity recorded in decibels. The intensity of this sound was very similar to the native speaker baseline of approximately 68 decibels, although slightly higher at 72 decibels. There were no significant differences between any of the groups on this measure.

Hypothesis 7 is accepted because the participants produced a voiceless velar fricative [x] in the majority of cases.

6.1.8 Hypothesis 8: Native speakers of Fang will produce the majority of Spanish trills ‘/ɾ/’ as an alveolar flap ‘/r/’?

Of the sounds examined in the present study, the alveolar trill exhibited the highest degree of inaccuracy. In spontaneous speech inaccurate productions of this sound may compromise communication between speakers depending on the allophone (s) that replaces it. In the present study the most commonly observed allophone was the alveolar flap, thus words such as \textit{perro} [pero] (dog) surfaced as \textit{pero} [pero] (but) etc.

The major difference between the trill and the flap is not necessarily one of articulation per se, but of timing. More specifically, the tongue is held in the same position as the flap for a longer period of time and air is continually passed through the active and passive articulators. An

\textsuperscript{30} Instances of [x] and [h] were measured as a single sound and not separately all allophones.
autosegmental model is unequipped to illustrate this dynamic but it can be illustrated through Articulatory Phonology (Browman & Goldstein, 1986; 1992; 1993; 2000) in the gestural score. Figure 6.3 shows the gestural score for the alveolar trill following Willis & Bradley (2008).

<table>
<thead>
<tr>
<th>Tongue Tip</th>
<th>Alveolar trill</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>V2</td>
</tr>
</tbody>
</table>

**Table 6.3** Gestural score for alveolar trill /ɾ/

In Figure 6.3 shows the final three sounds of the word *perro* [pero] (dog). What is important to take into consideration is the element of time that is expressed by the model allowing the alveolar trill to be differentiated from the alveolar tap which is shown in the gestural score in Figure 6.4.

<table>
<thead>
<tr>
<th>Tongue Tip</th>
<th>A. Flap</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>V2</td>
</tr>
</tbody>
</table>

**Figure 6.4** Gestural score for alveolar flap /ɾ/
In Figure 6.4 the flap is represented by the abbreviated tongue tip gesture illustrated with the words “A. Flap” (Alveolar Flap). When comparing Figures 6.4 and 6.5, the main difference between them is the longer interval to complete the tongue tip gesture for the trill.

When EGS speakers produce a flap instead of a trill it is precisely this extra interval of time applied to the tongue tip gesture that is not being carried out in the former. One explanation could be that the accurate production of the tongue tip gesture requires more effort and thus it is simply easier to produce the trill at the expense of possible miscommunication. In this sense it can be stated that the trill is less marked than the flap and thus due to a preference for the unmarked sound, speakers produce the latter rather than the former.

The production of the trill as a flap is in line with both Granda and Lipski. It is also in line with Quilis & Casado-Fresnillo, but they observed other variations that were not observed in the data for the present study.

The /ɾ/ and /r/ are not contrastive in word initial position in Spanish and the production of /ɾ/ instead of /r/ in this position should not result in confusion of meaning. However, in some examples of connected speech this replacement did have a compromising effect on meaning. For example, in the sentence Guinea Ecuatorial estaría repleto de niños a participant did not trill the /ɾ/ in word initial position in the word repleto. Due to the surrounding linguistic context, however, a native speaker or proficient user of the language can decipher that the speaker produced the word repleto even when not incorporating the trill where it was expected. However, in the following sentences the failure to produce the trill could result in miscommunication; 1) *Es de color rojo* (it is the color red) interpreted as *Es de color ojo* (It is the color (of an) eye), 2) *Probablemente se ría de Ud.* (He/she is probably laughing at you) Interpreted as *Probablemente sería de Ud.* (It would probably be yours). This was the case in several instances in the data.
The results from the phonetic measures revealed no significant differences for any of the groups for trill duration, indicating that most of the speakers produced this sound in basically the same manner. In comparison to the average duration for the trill in the Spanish norm (96 msec.), none of the speakers were even close to this measurement.

Hypothesis 8 is accepted due to the fact that trills were produced mostly as alveolar flaps.

6.1.9 Hypothesis 9: Native speakers of Fang will produce the majority of Spanish branching onsets of the type /Cr/ in word initial and word medial positions with deletion of one of the onset members.

Hypothesis 9 based its prediction on the findings of previous studies which showed that EGS speakers tend to delete one of the members of the onset. Fang does not employ this type of complex onsets.31

The results of the present study, however, showed that deletion only accounted for a small percentage of the total clusters simplification strategies, i.e. the flap sound, e.g. /madre/ -> [ma.re] (mother), /trato/ -> [ta.to] (I try), /primera/ -> [pi.me.ra] etc. Such segmental deletion in complex onsets has been seen in other studies (e.g. Lin, 2001; Broselow et al., 1998) and has been motivated by structural markedness. That is, since complex onsets are more difficult to produce than singleton onsets, speakers prefer to repair the cluster through some type of repair strategy of which deletion is one. In Broselow this was considered an instance of Emergence of the Unmarked,32 which is defined by the speaker’s preference to produce unmarked sounds, or

31 Fang does possess prenasalized consonants in the onset position word initially and medially. However, some of the nasals in this position are syllabic and others are unitary.
32 A concept based on the proposals of McCarthy & Prince (1994) though not applied to the dynamics of L2 acquisition.
clusters in interlanguage. Figure 6.5 below shows an example spectrograph of a /pr/ cluster produced without the C2, i.e. /ɾ/.

The spectrograph in Figure 6.5 represents the word *primera* as spoken by a female participant in the present study. The perforated lines demarcate the relevant area of the illustration. The tongue tip gesture that is needed to produce the alveolar flap was not executed and thus the cluster is simplified. There is also no acoustical evidence that a *svarabhakti* vowel is forming as no vocalic material is visible in the spectrograph.

As noted in previous studies that have treated these cluster types in Spanish (Schmeiser, 2006; Waltmunson, 2005), the physical production of the concurrent sounds requires complex articulatory coordination that can prove challenging for speakers whose L1s do not contain these constructs. In Major (1986) speakers also produced /Cɾ/ clusters in a variety of ways, some of which were the result of inexact articulatory timing including the presence of excrescent vowels and trilling of the flap. In Waltmunson (2005) native English speaking learners of Spanish
ultimately exhibited nativelike timing between the two segments for participants at the higher proficiency levels. Participants at the lower proficiency levels showed less nativelike timing with hardly any excrecent vocalic material between the sequence.

In the present study it is suggested that articulatory timing accounted for the production of the trill, i.e. [Cr], in place of [Cr], especially in clusters that involved successive tongue tip gestures such as /dr/ and /t̚t̚/. When trilling occurs the speaker holds the tongue tip gesture used for the flap in the same position while air continues to flow through the articulators. This prevents the speaker from having to coordinate two separate gestures, i.e. one for the first the first consonant and then another for the flap. Figure 6.6 shows a spectrograph of a trilled flap in the /Ct/ cluster along with a gestural score.

---

[33] As shown in the results chapter, /t̚t̚/ accounted for the majority of /Ct/ clusters.
The relevant gestures in Figure 6.6 are demarcated by the perforated line. The production of the /pr/ onset requires a great deal of gestural manipulation. There are two simultaneous gestures for the /p/, spread glottis and closed labial, and then another for the flap; closed alveolar. The coordination of these three gestures may have resulted in /ɾ/ neutralization due to the fact that L2 timing has not yet been acquired.
What is unclear, however, is whether a continual air flow with multiple gestures is easier to produce than a single tongue tip gesture to produce the flap. Surely a trill produced in this context as a result of uncontrolled articulation would exhibit a great deal of variation as there is no preconceived standard of duration as with normal flap production.

The majority of participants in this study, however, produced /Cɾ/ clusters in a manner that is very similar to the native speaker standard. There was a varying degree of vocalic material between the two consonants which is thought to be the result of inexact timing, and characteristic of the Spanish of native speakers. It is important to point out that during the analysis of /Cɾ/ clusters one could not perceive instances of significant vowel epenthesis, e.g. /garsias/ produced as [gə.ɾa.sjas] where the epenthetic vowel alters the syllabic structure. The type of intrusion observed was of the type that is illustrated through the superscript schwa, e.g. [gəɾa.sjas] and does not carry syllabic weight. The gestural score for which is given in Figure 6.7.
Figure 6.7 illustrates how the excrescent vowel is borne out of the coordination between gestures. Though not explicitly illustrated, it is important to note that when the glottis is not in the spread position it is in neutral position and generates enough voicing to account for the existence of the excrescent vowel demarcated between the perforated lines. The average length for the vocalic element reported in this study was substantially higher than those reported in Peninsular Spanish. Again, this seems to the result of inexact acquisition of articulatory timing.

Acoustic analyses of /Cɾ/ clusters revealed a major difference between male and female speakers due mainly to the observation that female speakers produced significantly longer clusters because they employed a trilling of the alveolar flap more frequently than male participants resulting in a longer C2. The exact motivation for trilling is unknown, however, it seems as though female speakers had less articulatory control for producing the flap in the context of a consonant sequence.

Phonetic measurements of length showed that /Cɾ/ in EGS are somewhat longer than the available baseline data for native Spanish speakers (Colantoni & Steele, 2007; Waltmunson, 2005). One motivation for this difference in length is that the articulatory timing may be somewhat slower for Fang speakers due to the complexity of the sequences and because of the high rate of C2 trilling in female speakers. As mentioned in the Contrastive Analysis, native Fang speakers do not have /consonant + flap/ clusters in the L1 and producing them accurately in the L2 requires more intricate manipulation of the articulators. Tests of statistical significance showed no significant difference in excrescent vowel production between males and females and
thus the disparity in length cannot be attributed to this phenomenon, but in the production of the segments of the clusters themselves.

Due to the fact that a high number of /Cɾ/ clusters were produced accurately and the unexpected phenomenon of trilling was observed, Hypothesis 9 is rejected as it had predicted deletion of the /ɾ/. There were definite instances of segment deletion but these did not represent the majority.

6.2 Summary
The data collected on Fang L1 speakers of EGS tend to support the supposition that Spanish is Spoken in EGS as a second language and is not only influenced by L1 transfer, but also by developmental phenomena characteristic of interlanguage. These outcomes and possible motivations thereof are outlined in Table 6.1.

<table>
<thead>
<tr>
<th>Observed results</th>
<th>NT</th>
<th>PT</th>
<th>L2 Rule/Norm</th>
<th>Other</th>
<th>Description</th>
<th>DS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. /V(#)pV/ -&gt; [tʰ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness L2 timing</td>
<td></td>
</tr>
<tr>
<td>2.1 /V(#)dV/ -&gt; [d]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>2.2 /V(#)dV/ -&gt; [⁰]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>3.1 /V#V/ -&gt; [ɾ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness L2</td>
<td></td>
</tr>
<tr>
<td>3.2 /V#V/ -&gt; [ɾ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness L2</td>
<td></td>
</tr>
<tr>
<td>4.1 /V(#)nV/ -&gt; [n]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>4.2 /V(#)nV/ -&gt; [ŋ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>4.3 /V(#)nV/ -&gt; [Ø]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>5.1 /V₁ # V₂/ -&gt; [V₁ # V₂]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>5.2 /V₁ # V₂/ -&gt; [V₁ # Ø]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>5.3 /V₁ # V₂/ -&gt; [Ø # V₂]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>5.4 /V₁ # V₂/ -&gt; [G # V₂]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>5.1 /V₁ # V₂/ -&gt; [V₁ # G]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>6.1 /V(#)pV/ -&gt; [pʰ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness L2 timing</td>
<td></td>
</tr>
<tr>
<td>7.1 /V(#)xV/ -&gt; [x]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>7.2 /V(#)xV/ -&gt; [h]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>8.1 /V(#)rV/ -&gt; [r]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>8.2 /V(#)rV/ -&gt; [ɾ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>9.1 /C#d/ -&gt; [C#ɾ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>9.2 /C#d/ -&gt; [C]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
<tr>
<td>9.3 /C#d/ -&gt; [Cr]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Markedness</td>
<td></td>
</tr>
</tbody>
</table>

NT = Negative Transfer, PT = Positive Transfer, DS = Dialect specific, not found in other Spanish dialects
Key to the proposals of this study are the items that receive an asterisk in the other column. Since these cannot be traced back to the L1 or to L2 rules, they must represent developmental phenomena commonly observed in interlanguages. The participants of this study were Fang native speakers and the observed results in Table 6.1 cannot be attributed entirely to the structure of the L1. However, they may be motivated by the following concepts: 1) Markedness, where a more structurally unmarked sound is selected that may or may not exist in the L1, 2) L2 Timing, where the gestural coordination patterns of the L2 have not yet been acquired, 3) Word Integrity, where words are produced as units with no binding processes between them such as word boundary hiatus resolution or palatalization, 4) Perceptual Salience, where speakers produce a sound in a particular manner to increase its auditory salience, e.g. an aspirated /t/ in word initial position, and 5) Equivalence Classification (EC) where speakers replace the L2 phoneme with the closest related phoneme of the L1 in the featural sense.

Although there were cases of negative and positive transfer, these were less attested than developmental phenomena. The presence of these phenomena can mean one of two things: 1) that Spanish is perpetually learned as a second language in Equatorial Guinea, or 2) a unique dialect of Spanish is forming in Equatorial Guinea that will eventually be passed on from generation to generation. Since at the moment, the majority of Equatorial Guineans learn the L1 before the L2, the study proposes that Spanish is Spoken as an L2 and exhibits the interlanguage variation expected.
6.3 Conclusion

The goal of this thesis was to examine the degree to which the L1 influenced the spoken Spanish production of native Fang speakers in Equatorial Guinea. Previous studies on this dialect had reported that inaccuracies in production were mostly caused by L1 interference; implying that Spanish was spoken as an L2 in Equatorial Guinea. Upon closer inspection of the L1, however, these inaccuracies cannot be contributed wholly to negative L1 transfer. For example, inaccurate production of /x/ in the L2 cannot be attributed to the L1 because it is not part of the L1 phonemic inventory.

Building further upon the thesis of Spanish spoken as an L2 in Equatorial Guinea, the present study suspected that developmental phenomena characteristic of interlanguages would also contribute to enriching the description of this dialect. In order to carry out this task, a study was conducted based on the strong and weak versions of the Contrastive Analysis Hypothesis. The first five of the nine hypotheses put forward were based on evidence in the Fang language published in descriptive studies. That is, the results were thought to exhibit either positive/negative transfer or nativelike accuracy. In the final four hypotheses the possible results were expected to stem from developmental phenomena, or nativelike accuracy (positive or negative transfer cannot take place as the target item does not theoretically exist in the L1).

The results of the Contrastive Analysis Hypothesis revealed that developmental phenomena play a substantial role in the description of this dialect as they occurred in both sets of hypotheses. In some cases, the phenomena observed in this study reflect those in studies of L2 acquisition where learners favor strategies that reduce the degree of markedness or enhance the perceptual salience of the target item.
The type of EGS dialect specific phenomena revealed in this study are distinct from other Peninsular and American varieties of Spanish, e.g. no dialects that this researcher is aware of implement flaps in place of trills, aspirated /t/s in place of unaspirated dental /j/s, or alveolar voiced stops [d] in place of the intervocalic approximate [ð] (see Table (?)above for more examples). However, these are interlanguage characteristics that would be expected in the output of individuals who speak or are in the process of learning Spanish as an L2.

The acoustical measures carried out showed that there were some significant differences between groups and that in some cases what seemed to be accurate production of L2 sounds, exhibited some phonetic differences that were not always reflective of the L2 acoustic norm. The study revealed substantial differences in segmental duration between Spanish and EGS that was thought to reflect incomplete acquisition of L2 articulatory timing of gestures.

The study concludes that there is enough evidence in the tests conducted to suggest that Spanish is spoken as an L2 in Equatorial Guinea based on certain transfer and developmental phenomena noticed in the spontaneous speech of Fang L1 speakers. Also, the fact that variation was observed while still utilizing a homogenous L1 group further solidifies this claim and refutes the possibility that non-standard forms are passed along from generation to generation\(^{34}\).

### 6.4 Limitations

Although the CAH supports the use of available descriptions on which to base contrastive analyses, researchers are limited by the detail and scope of these studies. This is particularly true for less commonly documented languages such as those spoken in Equatorial Guinea. The present study would have been more complete and accurate had it conducted an independent

\(^{34}\) However, this does not mean that a dialect of EGS is not developing as some of the data suggest that phenomena observed in previous studies have become more widely attested, e.g. lack of spirantization of /d/.
investigation of Fang. However, time and spatial restrictions did not allow such an analysis to be included in this study.

Although the recording quality of the interviews for the present study was clear and lent itself to acoustic analysis, a series of recording methodologies would have perhaps offered more insight into certain phenomena. This type of information collection had originally been planned, however, the materials chosen for examining the target items was not culturally identifiable enough for successful data elicitation.

Another limitation of the study resides in the adaptation of the blanket term “standard peninsular” in describing the model L2. That is, certain phenomena observed in the study could have been learned from teachers who were from regions where the standard model is not necessarily the norm, e.g. Galicia, Catalunya, Cuba, Mexico, Argentina etc. or perhaps they could even have been speakers of other languages entirely, e.g. Fang, French etc. For the most part, the present study based its assumption on what previous studies had reported. For example, Quilis & Casado-Fresnillo (1995) as well as Lipski (2000) report that the model of Spanish in EG is definitely that of a central standard dialect that would be heard by educated speakers in Madrid, for example. However, it could have benefitted the present study to have asked participants where their Spanish teachers were from as the education model has probably changed over the years from when all Spanish teachers in Equatorial Guinea were Spanish nationals. It must be noted, however, that all teachers at the Centro Cultural Español in Bata were from Spain except for the director of the center who was a Peruvian national, and it was unclear if she was also a language teacher. Many immigrants who move to EG from neighboring countries study Spanish at the Centro Cultural Español, and native Equatorial Guineans partake
in a myriad of social and cultural activities at the center on a daily basis, putting them in constant contact with instructors from Peninsular Spain.

### 6.5 Future research

The linguistic landscape of Equatorial Guinea offers a wide variety contact phenomena that would be of interest to linguists. For example, there has yet to be studies on Pichi, Bubi, or Bisio influenced Spanish. There is also a great need for an in depth analysis - phonological and/or acoustic - of many of the native languages of Equatorial Guinea. Any studies interested in the interaction between the native languages and Spanish would benefit greatly from such an analysis.

As far as understanding the future of how Spanish will be used in Equatorial Guinea, one has only to look at the most recent generations living in the most populated areas of the country to get a glimpse. Internationalization of the country since the late 90s has made it obligatory to use Spanish in order to be successful in the business world. In helping future generations achieve this goal, some parents have stopped using the native languages in the domain of the home, and this has given rise to a generation of monolingual Spanish-speaking individuals. Further research interested in the direction of EGS should focus on how the native production of this population differs from other world Spanish dialects. Such an investigation will help to answer critical questions about language development in general. At the moment, no one can tell exactly what EGS will be like in 10 or 20 years. However, this monolingual generation of speakers may hold some answers to this question.
Appendices

Appendix 1 – Story narration tasks

Historia 1
Historia 3
Historia 4

A

B

C

D
Historia 5

A

B

C

D
Appendix 2 – Corpus tagging script in PERL

use open IN => ':encoding(utf8)';
use open OUT => ':utf8';

open(IN,"<cura.txt");
open(OUT,">cura_out.txt");

while (<IN>){
   @txts = <IN>;

   foreach $t(@txts){

      $txt = $t;
      $txt =~ s/<.*?>//gis;
      $txt =~ s/\//gis;
      $txt =~ s/é/e/gis;
      $txt =~ s/í/i/gis;
      $txt =~ s/ó/o/gis;
      $txt =~ s/ú/u/gis;
      $txt =~ s/á/a/gis;

      #mid and low vowel hiatus
      $txt =~ s/\(w+o\s+e\w\)/ <3> $1 <3> /gis;
      $txt =~ s/\(w+e\s+o\w\)/ <3> $1 <3> /gis;
      $txt =~ s/\(w+e\s+a\w\)/ <3> $1 <3> /gis;
      $txt =~ s/\(w+o\s+a\w\)/ <3> $1 <3> /gis;
      $txt =~ s/\(w+a\s+e\w\)/ <3> $1 <3> /gis;
      $txt =~ s/\(w+a\s+o\w\)/ <3> $1 <3> /gis;

      #trill
      $txt =~ s/\s+(r\w*)/ <4> $1 <4> /gis;
      $txt =~ s/\(w*r\w\)/ <4> $1 <4> /gis;

      #flap
      $txt =~ s/\(\w*[aeilou]\r[aeilou]|m|n|s|l|b|c|d|fl|g|j|ll|q|p|t|v|z]\w\)/ <5> $1 <5> /gis;
      #$txt =~ s/\(\w+r\)s+/ <5> $1 <5> /gis;

      #voiceless velar fricative
$txt =~ s/\w+\(j\w+\)/<6> $1 <\6>/gis;
$txt =~ s/\(b\w+j\w+b\)/<6> $1 <\6>/gis;
$txt =~ s/\(w*[i|e]\w+\b)/<6> $1 <\6>/gis;

# voiceless labial stop p

$txt =~ s/\w*[paeiolo]b|c|d|f|g|h|c|m|n|q|s|t|v]\w*/<8> $1 <\8>/gis;

# palatal nasal ñ

$txt =~ s/\w*ñ\+/<10> $1 <\10>/gis;

$txt =~ s/\w*[bcdfgp][l|r]\w+/<11> $1 <\11>/gis;

# t and d

$txt =~ s/\w*[aeiolo][f|l][f|l]\w*/<12> $1 <\12>/gis;
$txt =~ s/\w*[aeiolo][f|l][f|l]\d[aeiolo][f|l]\w*/<12.1> $1 <\12.1>/gis;

#clear numbers

$txt =~ s/<1>/<i_init>/gis;
$txt =~ s/<1>/<i_init>/gis;
$txt =~ s/<1.1>/<u_init>/gis;
$txt =~ s/<1.1>/<u_init>/gis;
$txt =~ s/<2>/<f_dip>/gis;
$txt =~ s/<2>/<f_dip>/gis;
$txt =~ s/<3>/<hiatus>/gis;
$txt =~ s/<3>/<hiatus>/gis;
$txt =~ s/<4>/<trill>/gis;
$txt =~ s/<4>/<trill>/gis;
$txt =~ s/<5>/<flap>/gis;
$txt =~ s/<5>/<flap>/gis;
$txt =~ s/<6>/<v_fric>/gis;
$txt =~ s/<6>/<v_fric>/gis;
$txt =~ s/<7>/<g_int>/gis;
$txt =~ s/<7>/<g_int>/gis;
$txt =~ s/<8>/<p>/gis;
$txt =~ s/<8>/<p>/gis;
$txt =~ s/<9>/<s_coda>/gis;
$txt =~ s/<9>/<s_coda>/gis;
$txt =~ s/<10>/<p_nas>/gis;
$txt =~ s/<10>/<p_nas>/gis;
$txt =~ s/<11>/<o_clus>/gis;
$txt =~ s/<11>/<o_clus>/gis;
$txt =~ s/<11>/<o_clus>/gis;
```perl
$txt =~ s/<12>/<t>/gis;
$txt =~ s/<\12>/<\t>/gis;
$txt =~ s/<12.1>/<d>/gis;
$txt =~ s/<\12.1>/<\d>/gis;

#$txt =~ s/(<\w+>)[^<]*(<\w+>)/$1$2/g;
#$txt =~ s/(<\w+>)[^<]*(<\w+>)/$1$2/g;

#$txt =~ s/(<\w+>)\n*/\n$1\n/g;
#$txt =~ s/(<\w+>)\n*/\n$1\n/g;

print OUT $txt;
}
}
```
Appendix 3 – Sample tagged transcription

<d> De donde </d> <flap> eres </flap>

<flap> <p> Akurinam </p> </flap>

<flap> <p> Akurinam </p> </flap>

<o_clus> Centro </o_clus> Sur

si <v_fric> lejos </v_fric>

<t> esta </t> <flap> cerca </flap> <d> de </d> Gabon

un <p> poco </p>

si <flap> <p> porque </p> <flap> <hiatus> yo </t> estaba </t> <hiatus> en </hiatus> <o_clus> Libreville </o_clus>

si

si bueno si <p> pocos </p> son buenos y <o_clus> otros </o_clus> son malos

bueno si

mi mi <hiatus> <p> </o_clus> pueblo <o_clus> </p> <t> esta </t> <hiatus> bien

las <v_fric> gentes </v_fric> <hiatus> de </d> ahi <hiatus> <t> estan </t> bien

venden ahi "juca"

<t> y tambien </t> <t> estamos </t> ahi bien

<t> ya tenemos </t> <trill> <flap> carretera </t> <flap> </trill>

y luz

bien y <v_fric> <o_clus> trabajos </o_clus> </v_fric>

<hiatus> ya </t> estamos </t> <hiatus> bien ahi

en la

<v_fric> <o_clus> trabajo </o_clus> </v_fric> <d> de </d> moza

moza

moza

tu <v_fric> <o_clus> trabajas </o_clus> </v_fric> en <t> casas </t> <p> limpia </p>
tu <p> limpia </p> <t> la tu </t> <trill> barres </trill>
la <t> casa tu </t> <p> limpia </p> la mesa
<t> silla tu </t> lavas lo los <o_clus> <t> platos </t> </o_clus>
tu lavas las <trill> <p> ropas </p> </trill>
así es
en mi <p> <o_clus> pueblo </o_clus> </p> si hay muchos <flap> <v_fric> <o_clus> extranjeros </o_clus> </flap>
hay muchos gaboneses ahí
si
ah ah
yo si que <hiatus> <d> ido </d> </hiatus> en Gabon con mi <p> <o_clus> padre </o_clus> </p>
<t> estamos </t> ahi con mi <o_clus> madre </o_clus> <t> también </t>
si mi <p> <o_clus> padre </o_clus> </p> <v_fric> <o_clus> trabajaba </o_clus> </v_fric> ahi
<t> y también </t> mi <o_clus> madre </o_clus> <t> estaba </t> ahi moza
<t> estaba </t> <v_fric> <o_clus> trabajando </o_clus> </v_fric> con un <o_clus> blanco </o_clus>
si, <o_clus> frances </o_clus>
en <o_clus> Libreville </o_clus> , si
yo no <t> viviste </t> en mi <p> <o_clus> pueblo </o_clus> </p>
solamente <hiatus> yo </t> estaba </hiatus> en mi <p> <o_clus> pueblo </o_clus> </p> <p> pequeña </p>
mi <p> <o_clus> padre </o_clus> </p> <p> me <hiatus> llevo en </hiatus> Gabon
<p><d> después </d> </p> <d> de </d> <o_clus> presidente </o_clus>
ha <hiatus> <v_fric> <d> cogido </d> </v_fric> en </hiatus> Guinea
<p><d> después </d> </p> hemos <hiatus> <d> venido </d> aquí </hiatus>
<v_fric> aja </v_fric> así
hace muchos <p_nas> años </p_nas>
porque ahora yo ya tengo muchos hijos tres hijos

si aquí en Bata si

asi es

el mayor tiene edad de quince años el mayor tiene quince años

el otro tiene trece años y la otra tiene diez años

destinados todos estudian si

si quiere estudiar idioma

eh la otra quiere informática

y el otro quiere construir los camiones

viajero no, no fabricar los camiones

ah para que anda con coches grandes

viajero viajero manejar los coches grandes

hum hum los camiones grandes

el otro hum y el otro otro

no ha empezado nada

viajero viajero si

y porque ya tiene diez años ya no nos conoce lo que el quiere ser

si

si

si
comida de mi pueblo

cacahuete

tubérculo

CACAHUETE

si

aja

y "bambuza"

es de

hum "bambuza" es lo que hace como así

despúes tu me
tu tu coge esto

esto de
coco que es pequeño así

aja suelo cortarlo así

es pequeño

así
tu haces esto esto esto

con la
"bambutza" "bambutza"

si ajaa no, no es mantequilla

es eh cuando tu planta

ah cacahuete

tu suelen plantar esto tambien así

es así
<hiatus> hace así </hiatus>
<hiatus> cuando <v_fric> aja </v_fric> </hiatus>
<t> cuando tu </t> lo comes
tu lo haces así, <t> tu </t> hacer así
<hiatus> cuando <t> esto </t> </hiatus> que "suelemos" hacer así
<p><d> después </d></p> <t> tu </t> cocina
si, <t> esta </t> bien si
eh" <t> bambutza </t> " si
si, comemos <t> esto </t>, aquí en <t> Bata </t>
<d> cada </d> <d> sábado </d>
"<t> bambutza </t> "
"<t> bambutza </t> "

si
"<t> bambutza </t> "?
si, <t> esta </t> ahí en <flap> <d> mercado </d> </flap>
<d> cada </d> <d> sábado </d>
<t> y también </t> <t> estamos </t> en un <p> <t> pocopoquito </t> </p> <flap> <d> mercado </d> </flap>
ahí en <o_clus> nuestro </o_clus> <trill> barrio </trill>
se llama la Fina
<v_fric> ajaes </v_fric> <hiatus> no es </hiatus> un <p> poco </p> <d> de </d> es <flap> <d> mercado </d> </flap>
que suele vender el <d> sábado </d>
la Fina
hum, hum <flap> <d> mercadillo </d> </flap>
es <flap> <d> mercadillo </d> </flap>
suele ser <d> cada </d> <d> sábado </d>
todo los sabado

este mercado esta ahí en la Fina

ah cerca de de la fabrica de las
entrada del seminario

hum, hum

hum? pescado ahi

ahi en mercado

no

tu preparas pescado " pepesu"

o tu puedes hacerlo con chocolate

tu puedes cocinar con cacaíte

si con chocolate

aja no chocolate que metemos

en pan

no

eh? si

no

tu haces como chocolate

tu haces chocolate

que hacemos así en nuestro fang

aja así

después

metemos dentro de pescado<br> con tomate, cebolla, caldo
así es

si <v_fric> aja </v_fric> <p> por </p> eso se llama la Fina

<flap> <d> mercadillo </d> </flap>, es <flap> <d> mercadillo </d> </flap>

la Fina

<d> todos </d> los <d> sabado </d>

hoy no

<d> sabado </d>

donde?

lo <p> <d> puede </d> </p> buscar

<flap> <p> porque </p> </flap> hay muchos <trill> <flap> <t> restaurante </t> </flap> <d> restaurante </d> </flap> <trill> <d> de </d> </flap> "Malie"

de "Malie"

"Malie" "Malie" es <flap> <v_fric> <o_clus> extranjero </o_clus> </v_fric> </flap>

los <hiatus> <flap> <v_fric> <o_clus> extranjero </o_clus> </v_fric> </flap> <flap> <v_fric> aja </v_fric> </flap> <hiatus> "Mali"

no

es los <flap> <v_fric> <o_clus> extranjero </o_clus> </v_fric> </flap>

"Malie" " <flap> Serengale </flap> "

<v_fric> aja </v_fric>

eh

<v_fric> aja </v_fric> se vende en <v_fric> aja </v_fric> ahi vendea

<p> antilope </p> o <t> mono tambien </t> <flap> <d> mercado </d> </flap> <o_clus> grande </o_clus>

mono no a <t> matar </t> el mono

tu ahi en <hiatus> bosque <v_fric> aja </v_fric> </hiatus>

<flap> <p> para </p> </flap> <p> <o_clus> atrapar </o_clus> </p> <v_fric> aja </v_fric>

hacer <hiatus> <p> <o_clus> trampa </o_clus> </p> en </hiatus> bosque

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<p>después <d> tu </d> hacer <p> trampa <o_clus> </o_clus> <p>, así a <v_fric> coger</v_fric> <p> palo </p>

<p>después <d> tu </d> le <t> mata </t>

no

eheh <t> esto </t> que es <flap> <d> cuerda </d> </flap>

le <v_fric> cogen</v_fric> aquí

en cuello

ah <p> después <d> le </d> levanto así <hiatus>

la <hiatus> mano <trill> arriba </trill> <hiatus> así

así <p> después <d> </p>

el <flap> muerte </t> <flap>

<flap> murio </flap> si

" <flap> cuerpo </p> <flap> " <p> espin </p>

tambien así

si

a <t> mosquito <t> ? mosqui? 

" <flap> cuerpo </p> <flap> " <p> espin </p>

como le se <t> mata </t>

" <flap> cuerpo <p> </flap> " <p> espin </p> " <hiatus> <flap> cuerpo <p> </flap> <p> espin </p> <flap> " ( <flap> murmullo </flap> )

con es <hiatus> alto así <hiatus>

tiene <t> esto </t> que <t> es tu </t> le <t> matas </t> así

tu <flap> tiras </t> <flap> <hiatus> <t> esto </t> así <hiatus>, <t> tu </t> le <t> golpeas </t>

aqui en la <trill> barriga </trill>

<p> después <d> </p>

el el va a caer, <p> después <d> </p> va a <flap> morir </flap>

el cae
aja así (risas) aja a

cuanto cuándo tu a ir al mercado de

tu a montar en taxi

tu para ir ahi

<hiatus> tu puede también a caminar

tu puede ir a pie

o tu <hiatus> puedes andar, a montar en taxi

si

tu va a llegar ahi a pie

tu va a pasar a

la carretera, carretera, carretera,
carrotera, carretera, carretera

para llegar ahi

tu pasas correos delante

tu pasa al lada donde se vende petroleo

ahi

ahi delante ahi

ahi tu va

pasar para para llegar a

no, los blancos poco van ahi

<poco</p> van ahi
<p>poco </p> van ahi
me <p>poco </p> no van muchos ahi
<br>
<p>porque </p>
no
no
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