The production and perception of Libyan Arabic stress patterns by English speaking learners: A comparison with native speakers

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I dedicate this work to the memory of my father

Ahmed I. Altubuly

Acknowledgements

I cannot believe I am actually done, many times I thought that this work would never see the light but it got there in the end. I would like to thank a number of people who offered their experience, knowledge and support. I am grateful to my supervisor Dr. Wyn Johnson for her support and guidance; without her guidance this work would have never been completed. I am also thankful to Mrs Claire White who completed the proofreading and helped me to achieve a timely submission. I am also very thankful to Phil Schofield who taught me statistics and guided me in analysing the data; without his assistance this thesis would have never been accomplished. Many thanks to Enam Al-Wer and Nancy Kula who also guided me and answered my phonology/Arabic related questions. My gratitude also goes to all the members of the phonology research group who helped me by evaluating some of the recorded data and to the ladies who volunteered and participated in this study – without them this study would never have happened.

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Abstract

This dissertation examines the production and perception of some selected stress patterns in Libyan Arabic by English speaking learners and compares them to the production and perception of the native speakers. Two tasks were utilised to investigate the participants' performance: a picture naming and an identification task. Word patterns covered potential problematic and non-problematic areas. An optimality theoretic approach is adopted in the discussion of the results of the perception and production of stress by the participants (Chapters 5 & 7) while a metrical approach is referred to in the discussion of the Libyan Arabic stress system in Chapter 3.

It is found that structural effects (e.g. syllable structure, vowel quality, syllable position or class) have consequences on how the learners perceive and produce stress and on how they use this information in assigning stress.

The study found that if the stress patterns match in the L1 and L2, and they follow regular phonological conditions, the learners get these patterns right by just applying the predictable patterns. If the stress patterns are similar but applied differently and they contradict predictable conditions, these unpredictable and/or marked patterns are not accessible in the L2 despite their partial availability in the L1. If a particular stress pattern does not exist in the L1, then the L1 negative transfer effect may appear in the L2.

The misperception of stress is not only restricted to L2 learners but native speakers also fail in certain patterns to perceive the stress location. The learners use grammatical class and syllable structure as stress indicators but they show a deviation from the native speakers in using the vowel length cue. The native speakers are more sensitive to vowel length; the absence of vowel length or syllable closure in the stressed syllable in certain patterns prevent the native speakers from perceiving stress accurately.

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General Introduction

General Rationale

No work has yet been conducted with respect to the stress patterns of English-speaking learners of Libyan Arabic (henceforth LA) and the stress patterns of LA native speakers in a systemic and empirical manner. Some attention has been paid to consonantal acquisition (Al Mahmoud 2013, Shehata 2015) and syllable acquisition by English-speaking learners (Broselow 1978) and Julie's amazingly successful acquisition of Egyptian Arabic phonology, despite only starting at 21 years old (Ioup *et al* 1994). Also, some attempts have been made to provide a theoretical and descriptive based analysis of LA stress (Abumdas 1985, Elgadi 1987, Al Ageli 1995 among others). However, the current study is the first to provide a systematic and empirical examination of LA stress patterns and fills a gap in the research into the production and perception of LA stress, both by English speaking learners and native speakers.

This work was inspired by the researcher's own observations of English-speaking learners acquiring the LA dialect, in particular the stress in words of certain phonological patterns. It also responds to the general call by Zampini (2008) and Altmann and Kabak (2011) among others for further investigation intophonological development in languages other than English.

I have often noticed that, despite the complexity of my learners' first language (henceforth L1, i.e. English) in terms of stress, in their second language (henceforth L2, i.e. LA) they might mislocate the word stress. Perhaps this can be attributed to the fact that suprasegmental features such as stress or intonation are generally more difficult to acquire or store than segmental features such as sounds, based on the functional load of stress in the learners' L1.

The Current Study

This thesis is therefore about learners' and native speakers' use or processing of the stress of LA, focusing on some selected patterns of stress at the word level. Disyllabic and trisyllabic words along with disyllabic verbs are examined in order to answer the following research questions. By comparing of the constraints that seem to be operative in native speakers with those indicated by the learners' responses, we will extract information about how far the L1, universals or the L2 input seem to have guided the learners in arriving at their current stage of learning. The research questions are about the processes (approached through the constraints that may guide stress placement) and products (errors) of speech production and perception.

1. Which target stress patterns do English-speaking learners of LA perceive and produce accurately and which target patterns do they inaccurately perceive and produce?
2. What phonological constraints govern the production of stress patterns of native speakers and English-speaking learners of LA?
3. What phonological constraints govern the perception of stress patterns of native speakers and English-speaking learners of LA?

A group of native speakers is included in the study and their performance was systematically compared with the learners' performance. In the current study, the topic of stress isanalysed mainly from a phonological perspective, with reference to second language learning wherever appropriate. In production, the accuracy criterion is dependent on the pronunciation of native speakers. In perception too, the accuracy criterion is derived from the native speakers' production; which means that production should match perception.

I will show that misperception of stress is not restricted to L2 learners, but that in certain patterns, native speakers also failto perceive thelocation of stress. Secondly, I will show that despite the similarity between the two languages in terms of the primary stress location, as will be shown in Chapter 3, English-speaking learners of LA (the current study) and LA-speaking learners of English (Jleiyal 2004) still make production errors which mainly occur in unpredictable patterns (i.e. patterns that do not respect the basic rule of stress). This implies that despite the presence of these unpredictable patterns in the L1, the patterns are not easily transferable or accessible in the L2. Learners resist transferring patterns which they perceive to be irregular or marginal, since they realise that these patterns are unlikely to be the same in the other language (Kellerman 1979).

Currently there are two popular general approaches to linguistic analysis, including phonological analysis. Both can be interpreted, if controversially, as providing insights into how speakers actually process speech in perception and production. The first is a Chomskian rule-based analysis and the second is Optimality Theory (henceforth OT) which relies on constraints (for more details about OT, see section 1.3.2 of Chapter 1). In this study we will use the second approach.

Research also shows that there is an interaction of transfer with universals and developmental aspects which occurs in L2 performance (Waniek-Kimczak 2000; Broselow et al. 1998). This proves that unmarked structures can emerge in L2 learners despite their absence in the L1 and L2 (Youssef and Mazurkewich 1998). Therefore, an Optimality Theoretic approach (Prince and Smolensky 1993, 2004) is an ideal approach with which to analyse the learners and the native speakers' performance in order to capture the interaction between universals, developmental aspects and transfer. It has already been proven that OT provides a valid account of how learners' interlanguage is constructed and develops through the re-ranking of constraints (Tesar and Smolensky 1993, 1996, 2000). These constraints can handle the phenomena of markedness, transfer and universals through their requirements and their ranking during the learning process, more details of which are provided in subsequent chapters. I will also try to extend the scope of Optimality Theory in order to account for the perception of stress (from a phonological point of view) whilst investigating the case of English-speaking learners and native speakers of LA.

The stress systems of both LA and the learners' L1 (English) will be analysed. This task is simpler for the English stress system as various linguists have studied it very thoroughly in recent decades, within both rule-based and constraint-based phonological approaches. However, research has only rarely been conducted into the stress patterns of LA, leaving some unsolved problems behind. Due to space limitations, this study will therefore only examine some selected stress patterns found in LA and how they are produced and perceived by both learners and native speakers.

I hope this work will contribute to the field of phonology and provide an original piece of work with remarkable observations that benefit both theoretical and empirical analysis and lead to a better understanding of the phonological learning process of abstract forms such as stress, filling some of the gaps in this area.

Why Research the Production and Perception of LA by Adult Learners and Native Speakers?

Perception and production have been studied separately in previous decades using different methods and their relationship in phonology has remained unclear. Most phonologists concentrate their attention on the production of stress, whilst relatively ignoring its relationship to stress perception. However, this work focuses on both equally, using the same methods and procedures.

Quite apart from the lack of attention paid to this topic until now, LA stress presents some phonologically interesting features that differ from other Arabic dialects. It has been argued that the Arabic patterns of word stress are largely predictable, based on syllable weight. (Watson 2007; Hellmuth 2013). However, several dialects differ from the widely assumed predictable pattern of stress (Watson 2011). For example, stress in LA may occur word finally as in /buxa'laː/ *greedy*, /ma'ħɑl/ *shop*, /ta'riːx/ *history* and /lu'tˤa/ *floor*; prefinally as in /mu'handis/ *engineer,* /ʃi'baːni/ *old man,* and /'muriʃ/ *glass* or initially as in /'madirsa/ *school* and /'tˤalaba/ *students*. It does not always follow the quantity sensitive system, as there are cases where stress skips the heavy penultimate syllable and instead falls on the light antepenultimate syllable as a result of an interaction of stress with syncope and epenthesis. Stress might also land on the light antepenultimate syllable in the presence of other heavy syllables because of stem stress reservation, where stress retraction is blocked in affixation. Vowel quality also has a significant effect on stress assignment in LA: the quality of the low vowel can attract stress in disyllabic words but only in a specific phonological environment. Moreover, stress can also be phonemic when some words differ only in terms of the stress position. This implies that stress positioning in LA is not fully predictable from phonological factors alone. Further discussion about stress in LA can be found in Chapter 3.

The Structure of the Thesis

The organisation of the thesis is as follows. *Chapter 1* provides a general theoretical background which establishes the necessity for the research. *Chapter 2* sheds light on the relationship between production and perception and provides a review of previous studies on the production or perception of stress. *Chapter 3* analyses the stress system of English and LA in order to understand both the source language of the learners and the target language. *Chapter 4* provides an account of the data gathering methods, materials and design used in this study as well as the participants' situation as they acquire the language in a naturalistic setting with no formal instruction. This is followed by a laboratory section that presents figures from Praat for the attested items, demonstrating items with both nativelike and non-nativelike stress positioning. *Chapter 5* contains the results obtained from the production task for the two participant groups: the native speakers and the learners. *Chapter 6* provides an interpretation and discussion of the participants' production of stress. *Chapter 7* includes the results obtained from the perception task, for the two participant groups, again the native speakers and the learners. *Chapter 8* explains the participants' perception of stress. Finally, *Chapter 9* includes a summary of the main issues and limitations of this study and opens the door to further studies.

1 Chapter One: Theoretical Background

1.1 Introduction

This section is divided into three sub-sections. Firstly, I will define stress and its properties. Secondly, I will summarise how stress phenomena are handled in theoretical phonology, both in Chomsky and Halle's (1968) *Sound Pattern of English* (SPE) and OT. I will shed light on the Constraint Demotion Algorithm that is used to describe learnability in OT and demonstrate how the scope of OT can be expanded to capture perception. Finally, I will review the role of transfer, markedness and universals in phonology.

1.2 The Notion of Stress

Stress can be described as a prominence of one syllable compared to the others in a word. The stressed syllable is distinguished by having greater loudness, higher pitch or longer duration than the unstressed one (Ladefoged 2006). For example, if the amount of air which is pushed out increases, then there is an increase in the loudness (amplitude) of the produced syllable which is then perceived to be stressed. Alternatively, an increase in pitch may be perceived as stress, produced by a change in the use of the laryngeal muscles. The length of the syllable is another factor which creates what may be perceived as stress - the longer the duration of a syllable, the greater the chance that it will be interpreted as being stressed.

The phonetic characteristics of stress vary from one language to another. Vowel reduction, for example, cannot be applied to stressed syllables in English because reduction is a feature that distinguishes the least prominent syllable (Ladefoged 2006). In LA, vowel reduction does not generally occur in unstressed syllables. Furthermore, differences in the use of stress among languages lead to the existence of languages with different rhythms. For example, some languages are stress timed, meaning that there is approximately the same amount of time between each stressed syllable (Kager 1999).

Stress is a very important feature that must be acquired in second languages, because in some cases listeners may find it difficult to understand the speaker if their stress placement is incorrect. The major problem is that if the stress is wrong, the timing is wrong and the parsing of word boundaries becomes hard for the listener.

Many aspects make stress different from tone and pitch. (1) Stress does not assimilate to neighbouring syllables. (2) The effect of stress can be seen on segments, in that a vowel is sometimes lengthened in stressed syllables, a process which does not occur with pitch. (3) Moreover, stress prefers to be assigned to the edge of a word. However, in some languages it is the initial and pre-final syllables which are preferred rather than the initial and final ones due to an ’’extrametrical’’ condition which applies to their final syllables. Pitch, on the other hand, applies to all syllables. Syllables with long vowels and diphthongs are always heavy, while closed syllables are not always heavy; this depends on the language-specific properties (Kager 2007). (4) Each content word or phrase normally has to have one most prominent syllable which receives the primary stress. (5) In most languages, stress is assigned relatively equi-distant between syllables in order to avoid clashes (i.e. neighbouring stressed syllables) and lapses (i.e. chains of unstressed syllables). (6) Stress has various levels: primary, secondary and possibly tertiary; this depends on the individual language (Liberman and Prince 1977; Hayes 1995; Selkirk 1984).

It is argued by some experts that stress is not a feature of all world languages. In those that do possess it, however, it may be divided into three distinct of systems: (1) fixed systems, i.e. fully predictable systems, where stress patterns are determined only by phonological rules which assign stress to a certain position or type of syllable; (2) partially predictable systems, where both regular and irregular patterns of stress exist in the language; and (3) free or unpredictable systems, where it is difficult to formulate rules about stress assignment since the stress is contrastive (i.e. can fall on different syllables in a word that is otherwise phonologically the same, but has different meanings or grammatical functions which are distinguished only by stress) and phonology alone cannot therefore predict the stress patterns.

1.3 Stress in Theories of Phonology

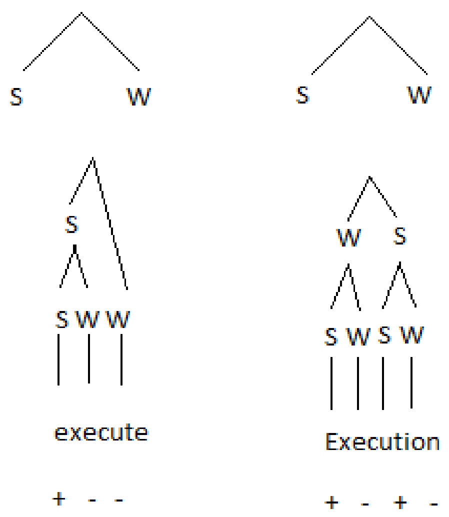
Here we will first sketch out some older theories before dealing with the framework (OT) which we will go on to adoptin more detail.

1.3.1 SPE and its Metrical Successors

The Sound Pattern of English' (SPE 1968) was the first work to systematically analyse stress. Chomsky and Halle dealt with stress as a segment which could carry a distinctive feature, with the main focus on the vowel. So features such as (±nasal, ± sonorant or ± stress) are treated similarly in the rules. Stress is considered as a feature which operates in accordance with rules and vowels are stressed in specific environments. These rules relate to morphological and syntactic structures as well as phonology.

The SPE model continued to be one of the comprehensive theories for many years which treated stress in English, to some extent, accurately. Later, however, a substitutional model was developed by Liberman and Prince (1977) which put an end to the linear phonology of the SPE. Within nonlinear phonology, two theories can be identified: autosegmental theory and metrical theory, the latter of which particularly analysed syllable structure and stress patterns. Based on Liberman and Prince's metrical proposal, stress should be treated as a characteristic or property associated with rhythmic hierarchies above the level of the segment, so stress is not a genuine property of segments but is rather constructed over a series of hierarchal levels represented as a tree, showing the phonological constituent structure of a word or phrase. In metrical theory, syllables are an essential part of this hierarchical metrical tree which always has binary branches. At each branch, down to the level of the syllable, one branch or node is always assigned as weak and the other strong. Each branching in the tree is divided into two sister nodes - strong-weak or weak-strong - and the node will be strong if it is branched. The other node is normally labelled as weak but if certain conditions apply, such as it dominating another strong node, then it will be labelled as strong. Liberman and Prince kept the feature [±stress] to assign to a syllable as an indication of syllable status and stress degree, so [– stress] syllables are dominated by weak nodes while [+stress] syllables are dominated by either weak or strong nodes. The most prominent (stressed) syllable in a word or phrase is then the one dominated by a succession of strong nodes at higher levels in the hierarchy.

Figure 1.1: Liberman and Prince Model



Liberman and Prince (1977)

Liberman and Prince (1977) incorporated the idea of a metrical grid into metrical theory in order to provide a solution for the clash problem. By applying a rhythm rule, the strong and weak nodes can be swapped, provided that [-stress] is only assigned to the weak node and the most prominent terminal node, which is now known as a primary stress, must be dominated by the strong node. The metrical grid is a hierarchal representation, so the height of the column is an indication of the relative prominence of the syllable, while the row in the grid represents the rhythmical alternation.

By building on this and exploiting concepts from the Chomskian Principles and Parameters approach, Hayes (1981, 1995) provided the field of phonology with a number of parameters (exclusive binary choices) such as right or left dominance, which can be used to classify the stress systems of world languages. In this framework, the stress rule operates as follows: segments are grouped into syllables and syllables are gathered together to construct feet and then those feet are grouped to form words. The main unit is the foot which consists of two syllables (this is not always the case as a foot can be composed of one bimoraic syllable or can be a monomoraic foot based on the language), one of which is considered to be a head, i.e. strong. In a right dominant language, the strong node (head) occurs on the right (iamb) while in a left dominant language, such as English or LA, the strong node occurs on the left (trochee). A further parameter concerns quantity sensitivity. In languages with quantity sensitive systems, such as English and LA, the dominant node i.e. the strong node, whether it is left or right headed, must control the heavy syllables. In quantity insensitive systems, however, no attention is paid to syllable weight in stress assignment, which results in heavy and light syllables being treated similarly. A third parameter concerns boundedness. In unbounded systems, the weight of the syllables is the controller because those systems are fully quantity sensitive, whereas in bounded systems, such as English and LA, the stress occurs at certain intervals relative to the word boundary. Directionality is another parameter which captures which end of a word is the starting point for building the metrical tree. In languages like English or LA, syllables are grouped to form the metrical foot starting at the right edge and ending at the left edge, but the process can start at the left edge and end at the right edge in other languages. One further parameter is extrametricality which allows a peripheral element (segment or syllable) on the left or right edge to be excluded from stress assignment.

Hayes (1995) presented three types of feet: the *moraic trochee* is the left headed foot in a quantity sensitive language; the *syllabic trochee* is the left headed foot in a quantity insensitive language and the *iamb* is the right headed foot in a quantity sensitive language. Syllables with more moras is considered heavier than a syllable with fewer moras. Hayes also demonstrated why a degenerate foot (single mora) is banned in many languages by imposing the minimal requirement in words that requires each word to have at least two moras as is the case in English and LA.

The set of binary parameters is insufficient to characterise every aspect of stress systems; the parameters can only handle predictable and phonological stress patterns. Moreover, the above approaches did not incorporate the ideas of markedness or universals and could not adequately deal with the perceptual aspects of phonological acquisition.

1.3.2 Optimality Theory

The birth of Optimality Theory has enabled much progress to be made in the analysis of stress patterns (Prince and Smolensky 1993, 2004). In metrical theory, the parameters of each language must be set as quantity sensitive or not, bounded or not, and so forth, in order to then derive its stress algorithm. However, in a constraint based model, the constraints must be satisfied to the best ability of the optimal candidate. OT includes the underlying and surface forms of SPE in terms of the input and output, but the rules in between are replaced by ranked constraints in accordance with language specific requirements. In OT, major differences between languages in stress rules are instead handled by differences in constraint violations. A quantity sensitive language, for example, would be characterised by the STRESS TO WEIGHT and WEIGHT TO STRESS constraints (see below) being highly ranked, which would lead to stress patterns violating those constraints being instantly disallowed, while in a quantity insensitive language those constraints would be ranked lower, so stress patterns that violate them would be correctly allowed. There is a 'generator' whose role is to generate candidates; which are then 'evaluated' using the ranked constraints. The most highly ranked constraints are given priority to not be violated by the candidates. Using a table called a 'tableau', the candidates are listed in the first column and the constraints are ranked across the top from the constraint ranked the highest to the one ranked the lowest. A violation is represented in the body of the table by asterisk (*) and an exclusion is represented by an asterisk followed by an exclamation mark (*!). The least violated candidate and the candidate which violates the lowest constraint is the optimal one and is preceded by a tick ✓.

Tableau 1.1: Sample Tableau in Optimality Theory

Input	Constraint 1	Constraint 2	Constraint 3
Candidate 1	*!		
Candidate 2		*!	
✓Candidate 3			*

The faithfulness and markedness (structural) constraints are well known to phonologists. The former capture the correspondence between the underlying form (input) and the surface form (output), whilst the latter capture the surface form in terms of its structural wellformedness. These are the main markedness constraints used to account for stress assignment (McCarthy 2008):

- (PARSE σ): assign a violation for an unparsed syllable.
- FOOT-BINARITY: assign a violation for a foot that contains less than two moras or syllables.
- NON-FINALITY: assign a violation for words which have main stress on the final syllable.
- IAMB: assign a violation for a foot whose head is on the left.
- TROCHEE: assign a violation for a foot whose head is on the right.
- STRESS TO WEIGHT: assign a violation for a stressed light syllable.
- WEIGHT TO STRESS: assign a violation for an unstressed heavy syllable.
- ALL-FEET-LEFT: assign a violation for a stressed syllable away from the left edge of the word.
- ALL-FEET-RIGHT: assign a violation for a stressed syllable away from the right.
- *CLASH: assign a violation for adjacent stressed syllables.
- *LAPSE: assign a violation for a string of unstressed syllables.

However, the list is not limited to the above constraints. Other stress-related constraints have been proposed to account for the varied stress systems of the world's languages.

1.3.2.1 **Production in Optimality Theory**

Optimality Theory has been extended to capture language acquisition, both in terms of the L1 and L2. Languages or grammars of learners are seen as being composed of universal constraints that can be violated. The difference between languages, including between the language of L2 learners and that of native speakers, is represented in the variation of constraint ranking (Prince and Smolensky 1993, 2004, Tesar and Smolensky 1993). The learners need to alter the hierarchy of the constraints found in their L1 to be in agreement with the constraints in the L2; and they also need to activate any inactive constraints in their

L1 if they are fundamental in the grammar of the L2. In the learning process of OT, the focus is always on the re-ranking of the constraints that is determined by the mapping or the mismatch between the input (target language) and the output (learners' performance). The two main algorithms that have received the most attention are the Constraint Demotion Algorithm (Tesar and Smolensky 1993, 1998, 2000) and the Gradual Learning Algorithm (Boersma 1998, Boersma and Hayes 2001)[1].

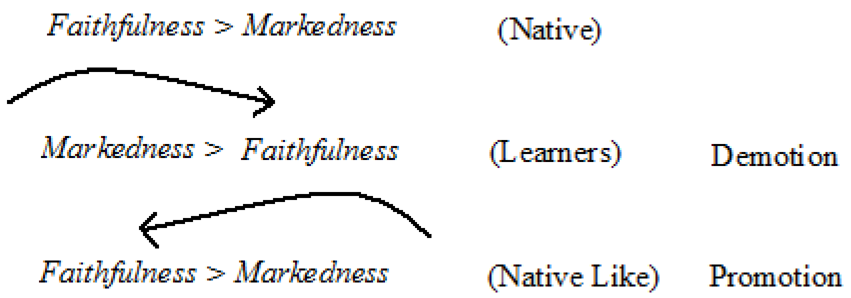
The general idea of constraint demotion is that the learner operates with (1) a range of universal constraints, (2) the output, and (3) the input. The hierarchy of the constraints is determined by the grammar of the learner. So if the output imposed by the grammar during the learner's acquisition process violates some constraints which are ranked more highly, these constraints need to be demoted in order to allow the L2 output that is realised by the learner to be optimal for them. This means that even if the output is not the accurate L2 form amongst the other candidates, constraints which are not satisfied must be demoted and outranked by the most satisfied ones.

Prince and Tesar (1999) claim that *markedness* constraints outrank *faithfulness* constraints, as a child would only produce the unmarked forms. They also claim that learners re-rank constraints based on the input data they encounter in learning. So when the grammar does not choose the form which the learner hears in the input as the optimal output, the constraint will be demoted to give a reversed ranking until the correct pronunciation is achieved. According to Smolensky *et al* (2004), at certain stages the ranking of the constraints will contain floating faithfulness constraints.

[1] Due to space limitations, the focus will be on Constraint Demotion and a version of the CD is adopted in the discussion chapters. For a detailed explanation of the Gradual Learning Algorithm, please refer to Boersma and Hayes (2001).

Broselow and Finer (1991) however, assume as we do generally in this account, that the initial stage of learning a second language is the last stage in the learning of a first language. Therefore, learners of an L2 need to promote the faithfulness constraint in order to master L2 forms accurately. If we assume that this claim is correct, the final stage in children is when they master their L1, so adult L2 learners such as those in our study start at that state when the available grammar does not select the correct forms that they hear in the input as their output and therefore, constraint demotion will apply. Once the learners make progress, floating constraints become part of the acquisition of the L2 grammar which increasingly chooses the output forms as optimal which do in fact match those in their L2 input**.**

Figure 1.2: The Promotion and Demotion of Faithfulness Constraints



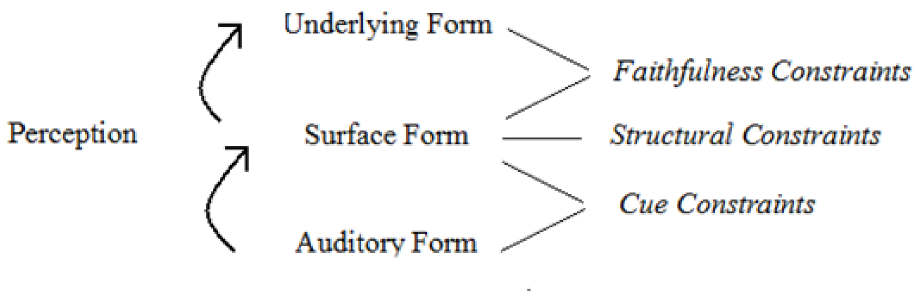
In the current study, the learners represent only a single stage of learning. Therefore, only the basic *Constraint Demotion* will be assumed to occur. The grammar of the native speakers of LA will be analysed and compared with the learner's grammar; constraints that would prevent the actual L2 output of the learners from being chosen as optimal will be demoted in order to obtain the learners' grammar. However, the learners' starting point surely cannot be the grammar of a native speaker of LA, which they somehow alter by demotion to produce erroneous LA outputs. Therefore, one can assume that the starting point in L2 is either the final stage in the L1, or simply a set of unranked constraints. It is believed that the acquisition process occurs through the demotion rather than the promotion of constraints; in fact, if a constraint is demoted then another constraint is automatically promoted and vice versa. Promotion and demotion are assumed to occur spontaneously in learning. However, Tesar and Smolensky (2000) argue against this claim as they state that only constraint demotion is possible in order to control the acquisition process. Green (1997) and Holt (1997) however, assume that constraint demotion is not the only method since there are some cases of historical change and of acquisition that involve the promotion of constraints.

1.3.2.2 **Perception in Optimality Theory**

The correlation between the surface and auditory forms reflects the interface between phonology and phonetics (Boersma 2007a). Linguists interpret this relationship by referring to *cues.* Boersma (2009) gave an example of vowel duration in English that can be used as a cue for a ± voice feature of the subsequent obstruent. Therefore the listeners might use the duration cue to perceive the voicing of the target consonant. In Optimality Theory, these cues can be used as *Cue constraints.*

Boersma (2007, p. 58) states that faithfulness and structural (markedness) constraints (Prince and Smolensky 1993) are well known to phonologists, where the former capture the correspondence between the underlying form (input) and the surface form (output) and the latter assess the surface form. However, cue constraints capture the listeners' awareness of the indicators that are represented in the connection between the auditory form and the surface form. The diagram below shows the function of the constraints in perception, known as bi-directionality of constraints.

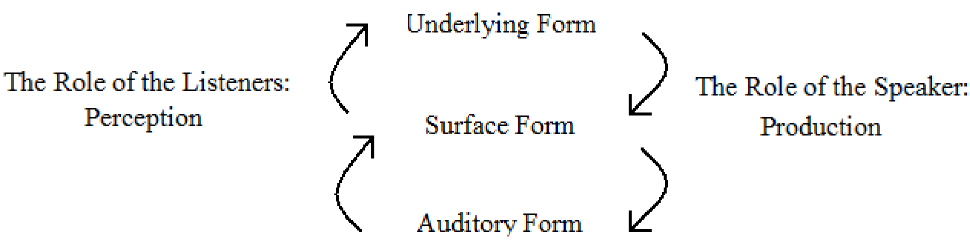
Figure 1.3: Function of Constraints in Perception



Bidirectional phonology by Means of Constraints
(Boersma, 2009)

The bidirectionality of constraints (Boersma 2009; Hamann, 2009) is exemplified in Figure 1.3 above, but other constraints such as lexical, sensorimotor and articulatory constraints are of no interest in this study and are not included here. *Cue constraints* are relevant to both the listener and the speaker. Therefore, the role of the listener is to turn the auditory form into a surface form in which cue constraints interpret the mapping from the auditory form to the surface form (i.e. from a non-abstract representation to an abstract phonological representation that is realised through syllables grouped into feet). Perception in optimality theory is concerned with two levels: the surface form and the auditory form. The perception process occurs through the evaluation of the cue constraints that are represented in duration, intensity, pitch, format, sonority (loudness including vowel quality) and structural constraints that are represented in language-specific conditions such as syllable structure, syllable weight and word alignment (Boersma, 2007, 2009). Other linguistic cues, such as grammatical category, are used in this study as a cue to identify the target in the surface form. Boersma argues that if there is general agreement that the interaction between faithfulness constraints and structural (markedness) constraints in OT can account for the phonological process of production where the output is faithful to the input, nothing prevents OT from analysing the interaction between structural constraints and cue constraints in order to account for the phonological process of perception in which the auditory form is a cue for the surface form. The structural constraints can evaluate the surface form (output) which is derived from the underlying form (input) in production and can also evaluate the surface form (output) derived from the auditory form in perception. The structural constraints restrict production and perception; therefore, cue constraints can be used in the ranking, just like other types of constraints such as faithfulness constraints as previously discussed. Figure 1.4 illustrates the mapping of the auditory form to the surface form in perception and the mapping of the underlying form to the surface form in production.

Figure 1.4: Mapping between Production and Perception



Routes of Perception and Production
(Boersma, 2009)

1.4 The Role of Transfer, Markedness and Universals in Production and Perception

We need to present some background coverage to illustrate the roles of transfer, developmental and universal aspects before moving onto the relationship between production and perception. For a long time, transfer – the influence of one's linguistic background – was the dominant concept affecting L2 acquisition, both positive and negative. In positive transfer, it is predicted that when phonological similarity occurs between the L1 and L2, this will ease the learning process and result in an error free performance. However when phonological differences exist between the L1 and L2, the performance of learners will be affected negatively and contain errors, i.e. imperfect acquisition. This is what is known as the Contrastive Analysis Hypothesis (CAH) (Lado 1957). Soon after, CAH was criticised when it was reported that learners do not always make errors which are predicted by the CAH. After the work of Selinker (1972), it was no longer claimed that transfer alone can account for all learners' errors and other factors were acknowledged which cause errors such as developmental or universal tendencies which are prominent in L1 acquisition.

A further claim was made by Eckman's Markedness Differential Hypothesis (1977). According to this, the degree of difficulty of different aspects of phonology is the main hindrance to the learning process: differences in phonological aspects are not the main reason for learning problems per se. Specifically, marked aspects of phonology cause difficulties for learners while unmarked aspects do not incur learning difficulties. Furthermore, Eckman's Structural Conformity Hypothesis (1991) claimed that errors are the result of universal preferences because the learners' performance is governed by universal tendencies along with markedness and L1 effects.

Major's (1987) Ontogeny Model found that transfer has an effect in the initial period of acquisition and this effect decreases during subsequent developmental stages. Later, the Ontogeny Phylogeny Model (Major 2001) showed that marked aspects are not affected as much by transfer as unmarked ones. This may mean that marked aspects in the L1 are not transferred easily to the L2. I associate that idea with Kellerman's work. It is also similar to Eckman's idea on markedness in the L2. OT claims that if L1 has forms that violate a universal markedness constraint, which must therefore be low ranked, learners might be quite prepared to promote that constraint to a higher place (as a result of demoting the faithfulness one) in the L2 grammar. It is possible that they would not insist on transferring its low ranking into the L2. I assume that the concept of rank demotion works the same for L2 perception as for L2 production.

Some researchers have found that transfer does play a role, not only in production but also in L2 perception. Flege's (1995) Speech Learning Model and Best's (1995) Perceptual Assimilation Model are more or less similar in their predictions regarding how the learners' L1 patterns can determine their L2 perception. In this account sounds that are similar in the L2 and L1 are in fact seen as difficult to perceive while different sounds or completely new sounds are less difficult to perceive in the L2. It is predicted that when phonological similarity occurs between the L1 and L2, this will ease the learning process and result in error free performance. However, this is not always the case because if similar patterns represent marked or irregular aspects in the language, error free performance is not guaranteed.

There is growing awareness in second language research, then that errors in L2 are due not only to transfer but also to markedness and universal grammar. Hancin Bhatt (2008) states that ''developmental effect is captured by markedness generalisation''. A definition of markedness by Eckman (2008) follows: '' Markedness can be defined as if x is more marked than y if the presence of x implies the presence of y but not vice versa and markedness can also refer to statistical frequency of segments, structures features or patterns in languages of the world or in a specific language''.

Importantly, using an optimality theoretic approach, Broselow, Chen and Wang (1998) found that learners were able to use an unmarked pattern that was not a part of either their

L1 or L2. According to their analysis, the unmarked pattern emerged in spite of its absence in both the source and target languages. The core of the claim is this very *emergence of the unmarked* surfaces in the interlanguage and it occurs without an appeal to further input, since it is considered to be part of universal grammar. In OT, the L1 constraint ranking is expected to be the starting point, or occasionally a set of unranked constraints. One might, however, expect promotion of markedness constraints, so that unmarked forms can be optimal, regardless of the L1 constraint ranking in which markedness might possibly be low if the L1 has marked forms. However, transfer from L1 is still seen as one of the most powerful influences on performance in the L2. It has a major effect at the segmental (Zampini, 1996), syllabic (Broselow 1978) and stress levels (Archibald 1993).

Apart from the modifying effects of markedness and UG, the degree of L1 influence on the L2 might also differ based on the learning situation, in other words whether it is classroom guided or naturalistic. For instance, a definite claim is made that the "more formal the task is, the less L1 influenced'' (James 1996). In our study, which does not involve highly formal tasks, we might therefore expect more transfer.

In contrast to approaches towards L2 acquisition which emphasise access to L1 transfer as a key feature are those which claim that children can naturally acquire their second language like the first language, through access to a set of principles included in Universal Grammar, with the need for very little L2 input. However, some researchers believe that acquiring a second language is different from L1 acquisition, since adult L2 learners do not have any direct access to UG but rather have access to their L1, which may cause either negative transfer resulting in errors, or positive transfer resulting in correct performance, as we have described above (Bley-Vroman 1989, 1990); if adults can access UG, then it is through their L1. However, the proposal that adults either have no access or have full access to UG is not supported by the evidence; rather White (1989, 2003a; 2003b) argues that learners' acquisition of the L2 with its complexity cannot just be achieved through their L1 together with L2 input. In fact, there is evidence that learners might adopt values that are not part of either their L1 or L2 as noted by Broselow (1998, 1983). In our study, therefore, as discussed earlier, we take the stance that our participants, when performing in the L2, in addition to L2 input, have access both to a universal set of OT constraints, to their L1 constraint ranking, and also to knowledge that some constraints embody universally unmarked language features, regardless of whether the unmarked situation occurs (is optimal) in either the L1 or L2. Much discussion of transfer centres on the issue of similarity and dissimilarity between the L1 and L2. Major (2008, p. 66) said ''the moderate version of (CA) seemed to address one aspect of the problem of *predictability*''. He links *predictability* to *similarity* but he does not explain what aspects of similarity or predictability might cause this problem. In the current study, I will use the term 'predictable' patterns to refer to those patterns which are available in the two languages and are considered to be unmarked or default patterns. I will use 'unpredictable' for those patterns which are available in both languages but which are not considered to be default or unmarked patterns. We expect to find that similarity might or might not cause a problem. If patterns which are similar in the L1 and L2 reflect predictable unmarked patterns, then they might not cause a problem because positive transfer of the underlying L1 rules or constraint rankings will occur. If similar patterns reflect unpredictable patterns in the L1 and L2 however, then such transfer might not occur. This means that not all similar patterns are easy to learn, and that it also depends on the markedness of the pattern in question. So if the attested patterns are not reflective of the default pattern, then similarity between L1 and L2 becomes irrelevant and positive transfer does not occur; consequently, the role of markedness becomes more important.

We could describe this as an interaction between the markedness phenomenon and L1 transfer. In fact, the Ontogeny Model (Major 1987, 2008) claims that an interaction between transfer and universals occurs in the interlanguage of L2 learners. One of the pieces of evidence for this was found in Polish learners who assigned stress in English. The learners did not stress the penultimate syllable in accordance with their Polish L1 stress pattern, so there was no clear evidence of L1 transfer but they did stress syllables with diphthongs and long vowels in accordance with the unmarked universal tendency of stressing heavy syllables in quantity sensitive languages (Waniek-Kimczak 2002). This means that an unmarked universals was chosen instead of their marked L1 stress pattern.

In rule based models, it is difficult to capture the interaction between transfer and developmental and universal effects. The mechanism of parameters in analysing L2 stress patterns, for example, can capture the transfer phenomena but not markedness. However, through constraint ranking Optimality Theory can capture how learners turn to unmarked patterns despite the presence of similar marked ones in their L1. In other words, it shows how unpredictable patterns are not accessible in the L2 despite their presence in their L1.

1.5 Conclusion

The aim of this chapter was to provide the necessary theoretical background on stress. Theories of stress in phonology were presented, from Chomsky and Halle's (1968) *Sound Pattern of English* (SPE) to OT. I showed how OT is not limited to production and how it can be used to analyse perception. I also illustrated the role of L1 transfer to the interlanguage, along with universals like markedness and developmental factors which may affect our participants' performance.

2 Chapter Two: Production and Perception in Stress

2.1 Introduction

The aim of this chapter is to shed light on the relationship between stress production and perception. This chapter will be divided into two sections: First, I will give a brief summary of the relationship between production and perception and a summary of the models that have been used to investigate the production and perception of stress. Secondly, I will present studies which are focused on the production of L2 stress, followed by studies which concentrated on the perception of stress and its relationship with production.

2.2 The Relationship between Stress Perception and Production

Phonologists have traditionally focused on production, paying either no or very little attention to the nature and role of stress perception (Anani 1989, Archibald 1993, 1997, Pater 1997, among others). Correspondingly, researchers working on stress perception usually studied stress without investigating L2 production and its relationship to perception. Interestingly however, researchers have now discovered that the study of stress from a production perspective will be incomplete unless perception is also considered (Dupoux et. Al. 2001; Peperkamp and Dupoux 2002, among others). Only very recently have stress production and perception both been examined in large scale studies (Altmann 2006 and Kijak 2009).

There are several current theories with respect to the production-perception relationship, which is understood in different ways by different researchers.

(1) Some researchers claim that perception monitors production, and so learners cannot acquire L2 forms if they only depend on indications that come from production. In other words, perceptual accuracy must be present before the mastery of production, which means that information about L2 stress largely comes to the learner via what they hear (i.e. listening perception is the source of information for learning production). Production is influenced by perception and in perceptual difficulties result in production difficulties. Although there are other studies which support other assumptions, the dominant hypothesis in segmental phonology is that perception precedes production, as in Rochet (1995) and Wode (1997). Archibald (1993) applied this idea to L2 stress but there are no other studies that support the theory that perception precedes production.

(2) Other researchers argue that production is in control of perception, so accurate production takes place prior to accurate perception (in segments, Kluge et. al., 2007 and in stress, Youssef and Mazurkewich 1998). This view remains unsupported by other researchers' work.

(3) Still other maintain that stress is different to other domains of phonology, and that there is no proven constant relationship between L2 perception and L2 production. Kijak (2009) and Altmann (2006), for example, discovered that the relationship between them is indirect, so good production does not entail good perception and bad perception does not entail bad production.

Finally, Kijak (2009) reports that the relationship between production and perception is different when it comes to stress even in the L1. Native speakers themselves, for example, are unable to perceive stress in their mother tongue but they are able to produce it correctly. Hence, more studies are required to investigate this relationship in both L2 and L1 and this is one of the aims of the current study.

2.2.1 Models of Production and Perception of L2 Stress

Different models have been used to investigate the acquisition of L2 stress production and perception. Dresher and Kaye (1990) used the metrical parameters that govern the stress patterns of the world's languages to create the Parameter Model which aims to account for the production of L2 stress. Using a parameter-based perception model, Peperkamp and Dupoux (2002) classified the performance of learners into hierarchical levels, claiming that where L1 stress is predictable and non-contrastive, the learners are 'stress deaf' in their L2 (i.e. the speakers will not be able to perceive the location of the stress).

The previous models have some drawbacks. Although the parameter model provides a solid basis upon which to build any metrical system, it only accounts for production, and furthermore cannot account for cases that are not attributed to phonology alone, but rather where the phonology of the language interacts with syntax and morphology.

In stress deafness perception studies, only one category of the world's languages (with a predictable system) is included in the stress deafness hierarchy, while the irregular and non-stress systems are excluded from consideration; moreover, they only account for perception (as claimed by Altmann 2006). Altmann (2006) proposed a model that categorises learners according to the type of their L1 stress system: whether it is a free stress, fixed stress or non-stress system. Altmann's Typology model can account for both perception and production for a wide range of languages. In the case of Arab learners, quantity sensitivity is an active parameter choice in their L1 so it is important to include words with heavy, light, close, and open syllables in order to compare their performance on all syllable types. Altmann's work (2006), does not deal with either heavy closed syllables or superheavy syllables since he restricted his study to open syllables. In large scale studies, it is difficult to test enough tokens of each relevant stress pattern for each language. Consequently, this leads to insufficient data to explain learner performance on each relevant pattern. One more problem in the Typology Model is that the predictability and unpredictability of stress in the L1 cannot alone account for L2 production and perception accuracy. This model suggests that the L1 stress type controls acquisition of L2 stress, regardless of the L2 stress type. If this were the case, then of course it contradictsthe notion of transfer, where the similarity between the L1 and L2 is the relevant factor. Kijak (2009) has found that, regardless of stress regularity or irregularity, the more information the L1 carries about stress, the higher the ability of the learners to perceive and produce the stress (i.e. by recognizing the stressed syllable in the words using cues such as vowel quality or quantity). The level of the stress, whether at word level or phrase level will affect the learners' performance in both production and perceptionwhen it differs from the L1. For example, French learners of English have been found to be stress deaf because of the fixed patterns of the stress in their native language. However, Kijak (2009) claims that this is not the only reason for this finding, because although Czech has a fixed pattern whereby stress falls on the initial position, they have not been found to be stress deaf in learning Polish. This is because of the level of stress they have in their L1. Similarly, Chinese learners were found to be stress deaf when learning Polish, but sensitive to stress positions when learning English. This can be attributed to the type of L2 and how it interacts with the L1; the acoustic cues which are predictive of the tone cues are absent in Polish but present in English. To sum up, Kijak maintains that the regularity of stress patterns alone cannot account for a learner's inability to produce or perceive stress. It seems that the previous models are still unable to provide a definite analysis for the process of perceiving and producing stress patterns in the L2, and to some extent in the L1.

2.3 Stress in Second Language Phonology

Most L2 stress studies have found that the learners' L1 stress system has a great influence on their L2 production (Maris 1989, Archibald 1993). These studies basically analysed the errors made in stress assignment in the L2. Archibald (1993), for example examined the production of English primary word stress by Polish, Spanish and Hungarian learners. He found that there are a number of possible areas of transfer between the L1 and L2, especially when the two languages represent different settings of stress-related parameters and he also found that production of stress is more influenced by transfer than perception.

In some studies, however, it has been found that transfer does not play a role in L2 stress patterns and neither L1 nor L2 stress patterns are used in L2 production (Pater 1997, Archibald 1997). It seems that the learners are able to develop patterns based on unmarked universals because they show patterns that are not compatible with either the target or source language.

The results of other studies have showed that native L2 stress patterns might be mirrored by the learners, especially if the L2 matches their L1 patterns. In the case of such instances of correct stress assignment, it is not known whether the learners are following the L2 or L1 patterns (Anani 1989, Youssef and Mazurkewich 1998).

Apart from Pater (1997), the hitherto mentioned studies used real words to test learner IL stress. This, of course, makes it impossible to be certain that the findings reflect a learner's knowledge of some phonological rules, parameter settings, or constraints (depending on the theoretical framework of the study) and not previous rote learning of stress which is stored on a word by word basis in the mental lexicon. Since we are interested only in the former, other systematic studies that used novel words such as Guion *et al*. (2004, 2005) are considered more valid.

In the work of Guion *et al*. (2004), the examination of stress resulted in different conclusions. Factors other than transfer have been found to have an independent effect on the L2 stress patterns. In a study of Spanish learners of English who had different proficiency levels, the learners only stressed certain types of syllables that are less marked. Furthermore the grammatical class of word also affected the stress assignment, as nouns and verbs were stressed differently. Another factor was the phonological analogy between real and non-real words that appeared in the L2 stress patterns. Overall, a variety of L2 IL stress pattern results (i.e. syllable structure, grammatical category and phonological analogy) have been found which show that learners adopt a variety of means to produce and perceive L2 stress, and do not just rely on transfer.

2.3.1 Production Studies

2.3.1.1 **Anani (1989)**

With a focus on production, Anani (1989) provided insights into how Jordanian learners produced English stress incorrectly due to the influence of their L1. According to Anani, such negative transfer occurs in three forms. Firstly, the final syllable always attracts the stress if it is a superheavy CVVC, CVCC in Arabic, while in English the stress tends to fall on the first first (*áppetite*) or the final syllables (*lemonáde*) if the final syllable is a superheavy CVVC. The second category appears in words which have heavy or light final syllables and heavy penultimate syllables, so the Jordanian Arabic stress patterns are replicated in English by stressing the heavy penultimate syllables instead of the antepenult ones as can be seen in *industry* and *forestry*. Anani found no sign of factors other than transfer at work; however, words which do not contain heavy penultimate or superheavy final syllables will result in stressing the antepenultimate syllable in Arabic[2], in contrast to the English patterns that assign stress to un-heavy penultimate syllables, as can be seen in *position* and *another*.

[2] Egyptian Arabic can receive stress on light penultimate as in /madˈrasa/

2.3.1.2 Aziz (1981) and Suleiman (1993)

In a similar study, Aziz (1981) spotted the main trends which were followed by Iraqi learners in producing English words. Words ending with superheavy unstressed syllables such as *complement* and *empire*, words containing heavy unstressed penultimate syllables such as *ancestor* and *calendar*, and words consisting of four to five syllables with heavy antepenultimate unstressed syllables followed by a light syllable such as *monastery* caused difficulty for the learners because the English stress patterns do not match their L1 patterns. Suleiman (1993) again agreed with Aziz (1981) that final English unstressed superheavy syllables and unstressed heavy penultimate syllables, along with words ending in a CVC syllable and preceded by a light penultimate syllable as seen in *develop* were problematic for Saudi learners who frequently incorrectly selected the heaviest syllable as the stressed one.

2.3.1.3 Jleiyal (2004)

The only study that I am aware of that analysed the stress production by Libyan learners of English is Jleiyal (2004). Again, she found that difficulty in pronouncing English words can be attributed to the transfer of stress patterns from a learner's mother tongue, which are well-stored in the learners' lexicon. There was more blocking with regard to extrametricality in the performance of the Libyan learners compared to the native speakers of English. The extrametricality condition was blocked in the learners' L2 stress patterns. So a word like *amazon* would receive stress on the final syllable. Minimal pairs that were distinguished only by the location of stress such as *import* (v) and *import* (n) were another source of confusion. In Jleiyal's work, no attention was paid to the perception of the stress patterns. No conclusion can be drawn as to whether or not there is a relationship between perception and production. One can conclude that the Arab learners followed certain general patterns in their English pronunciation: the avoidance of stressing the antepenultimate syllable is apparent unless it is the heaviest syllable; the penultimate syllable is the most favoured one if it is heavy and the final syllable can definitely attract stress if it is superheavy and even occasionally if it is heavy in the L2. These patterns all reflect regular L1 stress patterns, so unlike other more recent studies she found no evidence of universals/markedness factors at work.

2.3.1.4 **Taylor (2011a; 2011b)**

In Taylor's work (2011a, 2011b), the acquisition of Japanese - a language with a pitch accent (i.e. no loudness-based stress patterns) - by English-speaking learners was examined. In Japanese, the accent type (whether it is initial, medial, final or unaccented) is dependent on both grammatical and phonological aspects of the word – the part of speech, number of moras - and the speech environment - the involvement of function words. It is also largely unpredictable and lexical depending on the meaning of the words. It seems that the English learners followed systematic patterns in their performance rather than learning the Japanese accent patterns word by word. There was no L1 transfer but rather the learners made a generalisation based on the position of the accent and its grammatical category.

2.3.2 Perception and Production Studies

2.3.2.1 **Altmann (2006)**

Efforts have been directed towards analysing the production of L2 learners, while the L2 perception of Arab learners of English has been relatively ignored apart from Altmann (2006) and Youssef and Mazurkewich's (1998) work. Altmann (2006) found that learners with predictable L1 stress patterns which are different from English (Arab, Turkish and French) found it more difficult to identify the position of English stress, in contrast to other learners with either irregular or no stress systems in their L1. The influence of syllable weight appears in the performance of Arab participants, whereby they may be more successful at locating the stressed syllable if it is heavy. Altmann therefore claims that L1 transfer has no constant impact on the L2 forms in his study. The successful responses given by learners with unpredictable or no stress systems can be attributed to the effect of the L1, because they have no determined patterns to be transferred. ‘‘The expected result that learners with predictable stress will correctly locate the stress when it matches with their L1 as positive transfer however was not always found’’ (p.136). Another claim is that learners with a predictable L1 not only face a problem in identifying the stressed syllable in their L2, but perhaps also encounter the same problem in their L1.

Turning now to the results for production, the learners with predictable stress systems (Arab, French and Turkish) produced native-like L2 patterns and performed better than the others. This does not support Archibald’s (1993) finding which showed that the perception of stress by Hungarian and Polish learners who have predictable systems in their L1 is better than their production. The English participants (the control group) showed a default stress pattern in Altmann’s results in both perception and production.

2.3.2.2 **Youssef and Mazurkewich (1998)**

Youssef and Mazurkewich (1998) investigated the second language acquisition of the English stress metrical parameter by Egyptian L1 adults. The participants achieved better results in the production tasks than in the perception tasks, which indicates that good production does not imply good perception. They argued that their L2 learners were able to access the principles of UG and could reset parameters in their L2. They predicted that the participants would assign the stress correctly when it matched their L1 (positive transfer); however, few errors were found which could be attributed to the universal tendency of stressing heavy penultimate syllables (see section 1.4.1). In the case of mismatches between the L1 and L2, they predicted that negative transfer from the L1 may apply. In fact, however, the participants' performance indicated that some errors could not be attributed to transfer from their L1 since they contradicted Cairene stress assignment. Interestingly, the participants had no problems with items that followed the universal tendency to stress penultimate heavy syllables. However, the learners found the items that opposed both the universal tendency and their L1 patterns very problematic. Nevertheless, we cannot definitely conclude that L2 learners have access to UG based simply on Youssef and Mazurkewich's cases, where both the L1 and the universal tendency converge in stressing a heavy penultimate syllable: in their study it is difficult to draw a distinction between learners transferring from their L1 and following a universal tendency.

2.3.2.3 **Ioup et al. (1994)**

This is a case study of Julie, an English native speaker who moved to Egypt at the age of 21 as she was married to an Egyptian. She settled in Cairo and became an English Language Teacher. She acquired the language as an adult in a naturalistic setting without classroom instruction, a situation which very much resembles that of our participants. Arabic became the dominant language with her husband and the children. The researchers tested her pronunciation of Arabic including stress by recording her describing a recipe. The same task was carried out by six native and non-native speakers of Arabic. Her speech was evaluated as that of a native speaker by seven judges and as a non-native speaker by six judges. The control participants who recognised her foreign accent commented on the quality of consonants and vowels and some intonation and stress patterns. She was very successful in perceiving and distinguishing the Egyptians dialects from other Arabic Dialects. However, the study was mainly descriptive and did not focus on any specific phonological aspect of her pronunciation, nor on factors at work such as L1 transfer, as the focus was mainly to provide a case against the Critical Period Hypothesis.

2.3.2.4 **Face (2005) and Bullock and Lord (2003)**

Because of the extreme absence of studies about the acquisition of L2 Arabic, I will review some available studies about English learners of other languages in order to understand their L2 stress patterns. Face (2005) investigated the perception of Spanish stress by English learners. One of the findings was that there was a preference for perceiving the penultimate syllable as stressed rather than the final syllable in two syllable words and the antepenultimate syllable rather than the penultimate syllable in three syllable words. Although English is a quantity sensitive language, English speakers learning Spanish do not use syllable weight as much as Spanish native speakers do, but rather generalise regardless of the syllable weight, since there is a strong tendency to perceive the antepenultimate syllable as the stressed syllable.

Bullock and Lord (2003) however, found that English speaking learners of Spanish did not follow a constant analogical principle based on either English or Spanish in real or novel words. Similar to Face (2005), generalizations which lead to the antepenultimate syllable being stressed were found; however, in contrast to Face, the learners' L2 forms illustrated over-generalizations, in which the penultimate syllable were incorrectly stressed. The reason behind the above findings is not entirely clear, because both antepenultimate and penultimate stressed syllables are available to be stressed in both English and Spanish.

2.3.2.5 **Kijak (2009)**

Kijak (2009) investigated the patterns of learners of Polish to find out what happens when the L2 forms follow simply predictable patterns. Will learners face the same problems they do with languages which have more complex stress patterns? Kijak reported that, in fact, the English-speaking learners of Polish performed successfully. It seems that the learners realised how English stress differs from Polish stress. Moreover, transfer from the L1 was clearly avoided: for example, extrametricality was not applied and syllable weight was not taken into account by the English learners, so priority was given for the penultimate syllable to be stressed over the final and antepenultimate syllables, in accordance with the Polish system.

The only situation that showed the influence of syllable weight was where Polish does not assign the stress to the penultimate syllable, but rather to the antepenultimate one, as in some loanwords such as *uniwersytet*. Here, the final closed syllable received stress more often than the antepenultimate syllable. This finding contradicts those of Face (2005), whose participants preferred to place stress early in the words by applying extrametricality to the final syllable and constructing a trochaic foot from right to left.

Kijak's (2009) *Differential Hypothesis,* that predicts access to and transfer from the L1 with the usual simple difference – difficulty concept and the *DefaultValues Hypothesis* that appears to predict access to and use of universals (especially markedness) as is the case in L1 acquistion will be referred to in Chapter 4 to develop the stimuli and the assumptions of the current study.

2.3.2.6 **Taylor and Hellmuth (2012)**

Taylor and Hellmuth (2012) found that native English listeners performed similarly to the French listeners in Peperkamp and Dupoux's (2002) work. Their participants are introduced to Japanese-, Spanish- and Dutch-like words which are different in their stress position. These participants misperceived the stress location on different occasions. If the result of this study is confirmed, then the English speaking learners are more or less stress deaf. Investigating the acquisition of languages with unpredictable or partially unpredictable patterns from both the point of view of production and perception would therefore provide the field of L2 phonology with more information.

2.3.3 Summary

It is assumed that English stress patterns are both unpredictable and partially predictable (Altmann 2006; Kijak 2009) so English speakers also need to store the unpredictable stress patterns in their mental lexicon rather than simply always following certain rules or constraints. They might benefit from the unpredictable nature of their own stress system (cf Chapter 7& Conclusion), which may lead to good performance on production tasks. Does such knowledge enable the English speakers to produce native-like forms? However, the basic assumption in this study suggests that the exposure to foreign patterns, regardless of the learners' linguistic background, will possibly result in reduced performance in some L2 forms; contrary to the typology model (that states the perception and production of L2 stress is determined by the L1 properties). It assumes that learners whose first language carries unpredictable patterns will encounter fewer problems or even perhaps perform much better than others (Altman and Vogel 2002; Altmann 2006).

2.4 Conclusion

There are four main aspects may influence the learners' choice of stress in producing and perceiving stress: (1) L1 transfer to interlanguage, (2) universals like markedness and developmental factors which may affect the Interlanguage, (3) the learners' 'analogy' or 'generalisation' that they might make within their own interlanguage, and (4) the nature of the TL system (predictable or not) as evidenced in the input received by the learner. If our participants show any of the above mentioned aspects, these phenomena will be captured by OT based on the ranking of the constraints.

It seems therefore that not only the L1 background, but also the target patterns and whether they are free or fixed patterns, influence learner's performance. As can be seen by the various studies discussed above, however, there is no agreement between their results to confirm whether or not English speaking learners achieved native or near-native like forms. Studies such as those of learners of Spanish and Polish do, however, enable the current study to predict that learners acquire the default position before any other patterns. This is what happened in learning Spanish stress, where English learners perceived penultimate syllables as stressed syllables but failed to allocate the stress to other positions of stressed syllables (Face 2005, Bullock and Lord 2003). In learning Polish, their performance was much more positive because there is little need to go beyond acquiring the fixed default stress position. It will be valuable to investigate the acquisition of stress in other languages with very movable patterns such as Russian to see whether the findings will be compatible with the results of Spanish acquisition and also to investigate the acquisition of languages with fully or partially unpredictable patterns such as Turkish or Arabic to see whether the results will be in agreement with the findings of acquisition of Polish. Comparing the acquisition of other languages than English will provide an opportunity to examine not only the role of different L1s, but also the effect of the L2 itself, independently of its similarity or difference from L1, on the learning process.

3 Chapter Three: Stress in English and Libyan Arabic

3.1 Introduction

The objective of this chapter is to provide the necessary descriptions of both the target and source languages which will help to develop the hypotheses and the data required to test the participants. This chapter will be divided into two main sections: I will give a brief account of the stress system of English and a brief account of the stress system of Libyan Arabic.

This chapter will reveal the similarities and differences in these two languages and assist in determining whether the learners apply their L1 stress patterns or whether they set up stress patterns that differ from their L1 and L2. I should also note that I will present only the main points about the stress systems of the two languages, because a full treatment of the English and Libyan Arabic stress systems is beyond the scope of this thesis, as the main aim of this work is to investigate the stress patterns of learners of Libyan Arabic and providing a comprehensive analysis is not possible due to space limitations. An optimality theoretic account is adopted to discuss English stress, whereas for the time being, Libyan Arabic stress is analysed using the metrical approach. A further optimality theoretic analysis for LA will be provided in the discussion chapters in order to compare the ranking adopted by learners in stress assignment to the ranking of the target language.

3.2 The English Stress System

English stress has received an enormous amount of attention and it has been studied by many researchers over the past decades (Chomsky and Halle 1968; Liberman and Prince 1977; Hyman 1977; Hayes 1982; Kager 1989; Burzio 1994; Hammond 1999; Collie 2007 among others). English stress is neither fully predictable nor fully unpredictable. Researchers state that English stress assignment is very similar to the Latin stress rule that is based on syllable weight. So stress is assigned on the penultimate syllable if it is heavy, otherwise stress would move to the antepenultimate syllable. This is considered to be a general rule which has exceptions in the language (Kager 1989, Hayes 1995, Roca 1992). However, morphological factors might also affect the assignment of stress. Some suffixes retract the stress, some do not change the stress position at all and others receive the stress themselves. The English stress system is predictable when it is phonologically conditioned or morphologically conditioned. However, it is more complex and unpredictable when it is lexically conditioned. Stress is assigned to a syllable regardless of its weight, so a light antepenultimate syllable might receive stress in the presence of a heavy penultimate syllable and a final short close syllable might receive stress in nouns.

Generally, the final syllable in nouns is exempt from bearing stress if it is not a superheavy CV:C or heavy CV:. If the penultimate syllable is heavy, it receives stress; otherwise the antepenultimate one receives it. The analysis used here to illustrate stress assignment in English is mainly based on Hammond's work, adopting an optimality theoretic approach (1999, 648-330).

3.2.1 Developing Constraints

The fact that the final syllable is not stressed unless it complies with certain conditions motivates the NONFINALITY constraint as a one of the major constraints, prevents the final syllable from being stressed. In a word like *'cinema* for example, the antepenultimate syllable is stressed; this means that it is a TROCHAIC type of foot. In a word like *ve'randa;* however, the penultimate syllable is stressed; this does not change the type of the foot but rather imposes another requirement, the weight of the stressed syllable, constraint WSP. The satisfaction of the FOOT BINARITY constraint should be attained along with the satisfaction of TROCHAIC. Ine tableau 3.1, the optimal candidate satisfies the requirement of the constraints below:

- NONFINALITY: assign a violation to a stressed syllable in the final position.
- TROCHAIC: stress the syllable on the left edge of the foot.
- FOOT-BINARITY: foot should be binary.

Tableau 3.1

'cinema	**NONFIN**	**TROCH**	**FT-BIN**
√a.'(cine)<ma>			
b. (ci'ne)<ma>		*!	
c. ci(ne'ma)	*!	*	

WSP outranks TROCHAIC and FT-BINARITY in the tableau below, ensuring that candidate (a) *ve'(ran)<da>* is optimal. However, this does not capture the whole picture because in a word like *ca'noe*, the final syllable is stressed. Therefore, WSP is parameterised into WSP VV and WSP VC; the former outranks NONFINALITY while the latter is dominated by NONFINALITY.

- WSP VV: heavy syllables receive stress (with long vowel).
- WSP VC: heavy syllables receive stress (closed by a consonant).

Tableau 3.2

A. ve'randa	**WSP VV**	**NONFIN**	**WSP VC**	**TROCH**	**FT-BIN**
√a. ve'(ran)<da>					*
b. '(veran)<da>			*!		
c. ve (randa)'		*!	*	*	
B. ca'noe	**WSP VV**	**NONFIN**	**WSP VC**	**TROCH**	**FT-BIN**
√a. ca'(noe)		*			*
b. '(ca) noe	*!				*

The final syllable receives stress under certain conditions, if it contains a long vowel or is closed by a cluster. NONFINALITY is violated in *Canoe,* but because it satisfies the higher ranked constraint WSP VV; it is chosen as the optimal candidate and is not excluded. Hammond argues that words as '*minnow* and *'candy* are not exceptions because certain lax vowels become tense in word-final positions. However, Duanmu *et. al.* (2005) argue that certain words such as *com'mittee*, '*easy* and '*pedigree* are exceptions to the general rule because they are lexically conditioned. So NONFINALITY is revised as below.

NONFINALITY: assign a violation to a stressed final syllable if it does not have a tense long vowel or cluster.

Tableau 3.3

A. ba'lloon	**WSP VV**	**NON-FIN**	**WSP VC**	**TROCH**	**FT-BIN**	**ALIGN-R**
√*a. ba'(lloon)*					*	
b. '*(ba)lloon*	*!		*		*	*
B. mo'lest	**WSP VV**	**NON-FIN**	**WSP VC**	**TROCH**	**FT-BIN**	**ALIGN-R**
√*a. mo'(lest)*					*	
b. *' (mo) lest*			*!		*	*
C. 'animal	**WSP VV**	**NON-FIN**	**WSP VC**	**TROCH**	**FT-BIN**	**ALIGN-R**
√*a '(ani)mal*			*			*
b. *ani'(mal)*		*!			*	

In *ba'lloon*, candidate (b) is out due to the violation of WSPVV, in *'animal*, candidate (b) is out due to the violation of NONFINALITY and in *mo'lest*, candidate (b) is out because of the violation of ALIGN-RIGHT and.WSP VC.

Stress in English falls on a three-window syllable, from the rightmost syllable to the antepenultimate one. The ALIGN-RIGHT constraint is required to determine the direction of the parsing of syllables. So in a word like *A'merica,* the ALIGN-RIGHT constraint prevents the stress from falling into the leftmost syllable position.

ALIGN-RIGHT: stressed foot should align with the right edge of the word.

Tableau 3.4

A. A'merica	**WSP VV**	**NON-FIN**	**WSP VC**	**TROC**	**FT-BIN**	**ALIGN-R**
✓a. *A'(meri)<ca>*						*
b. ' *(Ame) (rica)*		*!				*
c. *Ame(ri'ca)*		*		*!		

3.2.2 Lexical or Non-Lexical Stress

Hammond fails to generalise the above ranking to cover words like *va'nilla* or *bassi'net* and treats these words as exceptions; the stress is assigned to the light penultimate syllable in *va'nilla* and to the heavy ultimate syllable in *bassi'net,* instead of assigning stress to the antepenultimate syllable such as in '*cinema* or '*animal*. The proposed solution is that neither phonology nor morphology can explain the irregularity of the above mentioned words. That is, because in these cases stress assignment is determined solely by the item itself, it is considered as a lexically conditioned stress pattern that requires a constraint to impose this ‘’lexical accent’’ on a specific syllable (Halle and Vergnaud 1987; Hammod 1999; Duanmu *etal* 2005). So the constraint below is suggested to handle this problem and allow candidate (a) to be optimal as it is lexically marked.

FAITH (v̊): ‘‘accented elements are stressed’’ (Hammond 1999).[3]

Tableau 3.5

A. bassi'net	FAITH (v̊):	NONFINALITY
✓a.*(bassi)'(nět)*		*
b. *'(bassi)nět*	*!	

If the ultimate syllable ends in a syllabic consonant or /i/, the stress might skip from the heavy penultimate syllable onto a light antepenultimate one in nouns, while the antepenultimate syllable is a possible stress bearer in verbs and adjectives if the penultimate syllable is light. Hammond (p.271) assumes that the ‘input representation’ for words like '*character* is /'kæ.rək.tr̩/ with only two vowels. The syllabic syllable is invisible to NONFINALITY and the penultimate one is excluded by the requirement of NONFINALITY. Therefore, the only syllable available to receive stress is the antepenultimate one. Kristofferson (2000) and Duanmu *et. al.* (2005) consider that stressing the antepenultimate syllable in the presence of the heavy penultimate syllable in this category of English words is an exception caused by the lexical accent. So if we compare the words /ˈkæ.rɪk.tə/ *character* and /vəˈræn.də/ *veranda*, the former resembles an irregular and marked stress pattern as the heavy penultimate syllable is not stressed (i.e. unpredictable pattern). In the latter, the stress falls on the heavy penultimate syllable in accordance with the regular predictable stress pattern. According to Hammond, the syllabic syllable is invisible and the violation of NONFINALITY by candidate (a) excludes it and optimises candidate (b) as illustrated in tableau (3.6).

[3] Another constraint is ‘’LEX-STRESS: Lexical Stress must be realized’’ (cf. Duanmu *et al.*, 2005) ” they also argue that these types of constraints are problematic because if words are lexically marked for stress then constraints will be useless, especially if this is generalised to other words’’.

Tableau 3.6

A. /'kæ.rək.tṛ/	**WSP (VV)**	**NON-FIN**	**WSP (VC)**
a. kæ.'(rək.tṛ)		*!	
✓b. '(kæ.r)<ək>.tṛ			

According to the standard descriptions of stress, words such as '*cinema*, and '*Canada* represent the regular patterns (as shown in section 3.2.1), while words like *va*'*nilla* and *Ala*'*bama* do not follow the predictable stress patterns because the final syllable is included in the stress computation. (Duanmu *et. al.* 2005).

3.2.3 Catalectic Suffix

Hammond's analysis (p. 278) of stress in verbs and adjectives is derived from Kiparsky (1991), Kager (1993) and Burizo (1994), but their proposals are not OT based analyses. First, Hammond suggests that NON-FINALITY should apply to all categories and accordingly he does not restrict it to nouns. This can be achieved by adding a catalectic suffix to unsuffixed verbs and adjectives (i.e. an empty nucleus). In nouns, the final syllable can be skipped by the requirement of NON-FINALITY; stress can be on the antepenultimate syllable. In verbs and adjectives, the catalectic suffix is excluded by the requirement of NON-FINALITY, resulting in an opportunity for the penultimate syllable to receive stress.

(a) Noun → '(cine) <ma>

(b) Verb → de'(velo) <pØ>

(c) Adjective → in'(sipi) <dØ>

3.2.4 Vowel Quality

In English, vowel quality plays a major role in stress. Hammond argues that there are three kinds of vowels based on the mora count: tense vowels give two moras; lax vowels give one mora and reduced vowels (schwa) are moraless. He adds that in certain environments, vowels are forced to be reduced and are consequently unstressed. The proposed constraint is REDUCTION. This constraint stipulates that vowels are weaker before consonants than before vowels or in the word final position. Collie (2007, p.59) rejects Hammond's analysis (p.249) that there is a relationship between stress and vowel reduction (in which only a schwa can occupy a final position pre-consonantally) and she supports her claim with examples, taken from Ross (1972, cited in Collie 2007), of English nouns that end in a consonant but are preceded by a full vowel such as *burl**a**p* and *ocel**o**t* (cf. Collie 2007). In the tableau below, candidate (b) loses the competition as it violates the requirement of reducing the vowel to allow stress to occur in the penultimate syllable.

Reduction: requires _C#→ reduced vowel

Tableau 3.7

A. 'dɒləp	**REDUCTION**	**FT-BIN**
✓a. '(dɒ)ləp		*
b. dɒ'(ləp)	*!	

It is worth noting that pre-vocalically stressless vowels are the only non-low tense vowels. Hammond (p. 210) claims that the absence of a tense low vowel in an unstressed environment comes from the proposed constraint:

NO-LOW.→*[lowV] |V

Various → /'væri**ə**s/

Heroin → /'her**o**ən/

Arduous → /'ardʒ**u**əs/

Archaism → /'ark**e**izəm/

The assumption here is that low vowels avoid occupying weak stressless positions. This can also be noticed if we compare the two following sets of examples. In A, the light penultimate syllable is not stressed but in B the light penultimate receives secondary stress. It is worth noting that that the stressed light syllables below contain a low vowel in B but the stressless light vowels in A contain a non-low vowel (p. 285).

A	B
Platoon /plə'tun/	*Raccoon* /ˌræ'kun/
Machine /mə'ʃin/	*tattoo* /ˌtæ'tu/

3.2.5 Morphologically Conditioned Stress

In poly-morphemic words, Kristofferson (2000) summarises morphologically conditioned stress by dividing morpheme-related stress into three types. The first is '*neutral*', in which the morpheme does not affect stress. Consequently, affixes are stressless but rather the stress maintains its original position on the stem such as in *h**a**ppily* and *n**o**velist.* Due to its neutrality, stress skips from the heavy syllable to the light syllable and it does not follow the ''stress heavy'' requirement as can be seen in '***pa**ssenger.* Such suffixes are *ly, er, ist, ed, ing, ness*[4] Other suffixes receive secondary stress but the main stress is not affected in the base form such as *ate, ise, hood* in words like *memorise* and *integrate.* The second type is a *'self-stressed'* suffixe where the main stress falls on the suffix. These types of suffixes receive primary stress such as, ese, *ette, ee, eer* as can be seen in *volun*'*teer* and *emplo*'*yee.*

[4] For the full list of suffixes and more details see Hammond (323-326).

The third type is called *'pre-stressed'* as it retracts stress from its original position on the stem to the preceding syllable as *ic, ical, ity, eous* do in *his'toric, cou'rageous, invinci'bility*. Other researchers refer to it as cyclic affixation as this type has two of levels stress assignment: stress is located on the syllable and is re-applied after affixation. However, the focus of this study will not require us to examine this pattern of stress assignment in more detail because the words used in the stimuli of this study are concerned with the neutral type of morphological conditioned stress.

Returning to Hammond's solution for neutral suffixes, he proposes a constraint that allows stress to skip from the heavy penultimate syllable onto a light antepenultimate one. His idea is that this type of affix is not part of the prosodic word. The constraint punishes any candidate, including its suffix, in the stress computation. However, Hammond's formulation of the constraint includes the word ''certain'' which means only some but not all, which enables other suffixes with tense vowels to receive stress.

NEUTRALITY: certain affixes are not part of prosodic words.

Tableau (3.8) demonstrates the position of NEUTRALITY in the ranking – it has to dominate the WSP to allow the skipping of the heavy syllable; otherwise candidate (b) would incorrectly surface as the optimal one. As a result of the violation of NEUTRALITY by candidates (b) and the violation of NONFINALITY by candidate (a), the optimal form is candidate (c) that left the suffix out of the stress computation to satisfy NEUTRALITY; the recognised final syllable is exempt under the condition of NONFINALITY but instead violates the WSP.

Tableau 3.8

A. 'government	**NEUTRALITY**	**NON-FIN**	**WSP**	**FT-BIN**	**PARSE**
a. *(go)(vern)'(ment)*	*!	*!		*	
b. go'(vern)<ment >	*!				*
✓c.*'(go)<vern>-#ment*			*	*	

3.2.6 Secondary Stress

English generally receives rightmost primary stress but this is not always the case, because sometimes the main stress is displaced from the right and the secondary stress occupies its position instead. Some words receive primary stress on the final syllable while secondary stress is placed on the antepenultimate one; for example, words such as ˌ*panta'loon* and ˌ*souve'nir*. Others receive secondary stress on the final syllable and the primary stress falls on a syllable located towards the left such as in **'*decade, 'Afghan***. Thus, the final superheavy syllable is not always stressed –sometimes it is lexically conditioned. Therefore, this pattern can be considered as an unpredictable pattern as it does not consistently follow the phonological condition of assigning stress on the final superheavy syllable.

Hammond's solution to this problem is to argue that the final syllable receives primary stress due to the requirement of WSPVV, while the final syllable can also receive secondary stress due to the requirement of FAITH. FAITH outranks NONFINALITY (cf. Pater 1995). Therefore, in '*Afghan*, candidate (b) incurs a violation because the penultimate syllable is recognised as a lexical accent. Candidate (a) is the optimal as it satisfies the requirement of FAITH. In ***pa**nta'loon,* the stress is not lexical - candidate (b) violates WSP so it is excluded, while candidate (a) is the optimal one despite violating NONFINALITY.

Tableau 3.9

'Afghan	FAITH	WSP VV	NONFIN	WSPVC	FT-BIN	PARSE
✓*a. '(åf)(ˌghan)*		*		*	*	
*b. (ˌ**af**) '(ghan)*	*!		*		*	

Tableau 3.10

***pa**nta'loon*	FAITH	WSP VV	NON-FIN	WSPVC	FT-BIN	PARSE
✓*a. (**pan**) ta'(loon)*			*	*		*
*b. '(**pan**)ta (loon)*		*!				*

3.2.7 Constraint Ranking

The constraints developed are listed below in their relative ranking. The lexically-conditioned constraints FAITH>>NEUTRALITY are highly ranked to guarantee that exceptions will receive stress on the allocated syllable, regardless of other predictable or general patterns that are governed by syllable weight, structure and position. The WSP constraint is also highly ranked but it is parameterised into nucleus-weight sensitive and coda weight sensitive, based on the number of moras: WSP VV >>WSP CODA. NONFINALITY is outranked by some of the WSP parameterised constraints in order to give rise to certain types of syllables which receive stress in the final position. Other major structural constraints such as TROC >> BINARITY >> ALIGN-R should be satisfied unless the satisfaction of lexical constraints requires their violation. Below is a summary of the main constraints that are required to assign the basic patterns of stress in English.

Ranking:

FAITH>>NEUTRALITY>> WSP VV>> REDUCTION>> NONFINALITY >> WSP CODA >>TROCHAIC >> FOOTBINARITY >> ALIGN-RIGHT>>PARSE.

3.3 Libyan Arabic Stress System

In the previous section, some facts about the English stress system were presented in order to provide an overview. I will now attempt to do the same with Libyan Arabic stress, but I will examine the data using a metrical theoretic analysis. The Libyan stress system will be revisited in the discussion chapters where I will adopt an OT approach.

3.3.1 Background of Libyan Arabic Stress

Some attempts have been made to analyse the stress patterns of LA. Mitchell (1960), Owens (1980, 1984), Laradi (1983) and Abumdas (1985) have provided a descriptive analysis of stress. Elgadi (1987) and Harrama (1993) explain the stress patterns using a rule-based approach. Al-Ageli (1995) is the pioneer in providing a constraint-based analysis. Sheredi (2015) discusses the interaction between epenthesis, syncope and stress in two varieties of Libyan Arabic. However, some phenomena such as the interaction between the stress position and vowel quality based on the grammatical category of the word are not covered and the irregular CV.'CVC pattern has not received any attention.

Mitchell (1960), Owens (1984), Hayes (1995) and Watson (2007) state that LA stress is analysed by using a combination of phonological and morphological rules and some of the rules are purely phonological. Syllables can be grouped into strong-weak feet, which yields a trochaic type of stress. However; no explanation was provided for the final syllable in the stress computation, since the final syllable is sometimes stressed but can be skipped and the pre-final syllable is stressed instead. Moreover, there was no mention of any exceptional cases at all.[5] Yoda (2005)[6], in a descriptive analysis, reports that stress in the Tripoli accent occurs finally or pre-finally and she also mentions a list of words that are lexically stressed. Abumdas (1985) summarizes LA stress by postulating three rules: the rules must be applied in sequence, so the second rule cannot be applied until the first proves to be inapplicable.

1- Stress the final CVC.

2- If the final syllable is not CVC, stress the penultimate one

3- If the penultimate syllable is CV then stress the antepenultimate one.

However, some final CVC syllables are not stressed and stress is assigned to the preceding syllable. So CVC in /'ruʃin/ *window* is not stressed and the final CV is a possible landing site for stress as in /wal'la/ *is n't it?* These problem areas have not been tackled by Abumdas's rules.

Al-Ageli (1995) provided the literature with a more systematic analysis of stress patterns. So the algorithm which he proposes is, to some extent, successful in calculating stress assignment in Tripolitanian Arabic (TA) - that is by constructing trochaic feet from right to left. The problem with his algorithm is that it does not account for irregular patterns and it also gives an invalid generalization about the exclusion of the final syllable, if it is not superheavy, from the stress computation. He claims that TA disfavours final prominence in general.

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[5] Mitchell (1960); Owens (1984); Hayes (1995) and Watson (2007) describe a variety spoken in the Eastern part of Libya (Benghazi) which is slightly different from the Western dialect (Tripoli).

[6] Abumdas (1985); Yoda (2005) and Al-Ageli (1995) analyse the dialect spoken in Western part of Libya (Tripoli).

Angoujard 1990, McCarthy (1979) and de Jong and Zawaydeh (1999) report that Arabic dialects do not generally allow stress to fall in the final position unless it is superheavy and the final CVC is only shown to be heavy non-finally in Arabic dialects which I found to be misleading, especially when it comes to the North African dialects. It seems that the question whether or not to stress the final syllable is a distinction between Palestinian, Lebanese, Iraqi, Jordanian and Egyptian dialects on one hand and Libyan, Tunisian and Moroccan dialects on the other hand. This means that only the Middle Eastern dialects disfavour final prominence.

In addition to the finality problem which is still debatable, the existence of the secondary stress is not yet confirmed in Arabic dialects. In stress-timed languages, the interval between stressed and unstressed syllables is reported to be specified; the period is usually one or two syllables (Selkirk, 1984). LA is a stress timed language which means that long words consisting of five ormore syllables may have both primary andsecondary stress in LA. However, there is a disagreement among phonologists about the existence of secondary stress in Arabic in general. So Halle and Vergnaud (1987) and Hayes (1995) claim that most Arabic dialects do not have secondary stress. I will not discuss this issue further.

3.3.2 Libyan Arabic versus Standard Arabic

LA stress has similar rules to standard Arabic: (1) stress the final superheavy syllable as in /ħi'saːb/ *account*. (2) if there is no superheavy syllable, then stress the heavy penultimate syllable /ka'tabna/ *we wrote* (3) if there is no heavy penultimate syllable, then stress the antepenultimate one as in 'rasama /he drew/.

The three patterns mentioned above have equivalent patterns in LA: min'daːr /mattress/ with a superheavy stressed syllable, /gar'ʒuːma/ *throat* with a heavy penultimate syllable and /'mariga/ *bib* with a light antepenultimate one.

The first pattern only gives permission to superheavy syllables to be stressed finally; however, it fails to account for some words which end in heavy stressed syllables such as /ma'ħal/ *shop,* /buxa'laː/ pl *greedy,* or in light syllables such as /lu'tˤa/ *floor.* The other two patterns permitthe antepenultimate syllable to be stressed only if it is the heaviest, or there are no other heavy competing syllables. However, there are cases where stress avoids heavy penultimate syllables and lands on light antepenultimate ones, such as in /'madirsa/ *school* or /'ji.kit.bu/ *they write.*

3.3.3 Transparent Stress

According to Watson (2011), stress in Arabic dialects is determined by both syllable weight and syllable position. Arabic dialects vary in their syllable structure, whether the stress assignment is stretched to the antepenultimate or pre-antepenultimate syllable from the right edge. It dependss on the relationship between syncope, epenthesis and stress along with whether or not lexical information impacts upon stress assignment.

Stress in LA can be transparent stress where syllable weight and position play a role in stress assignment, or opaque stress where epenthesis and affixation have a clear impact on stressed syllables. In the former, the Standard Arabic rules are successfully applied whereas in the latter, standard rules fail to account for the interaction of stress with epenthesis.

3.3.3.1 **Syllable Weight**

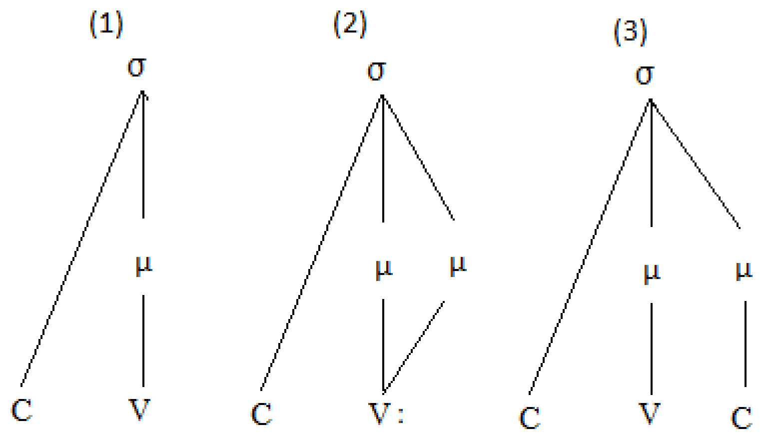
Similar to Standard Arabic, the Libyan dialect identifies three weight levels: superheavy, heavy and light, but it also has different syllable types because this dialect allows biconsonantal clusters (Abumdas 1985; Al-Ageli 1995; Yoda 2004). Light syllables are the open syllables CV and CCV; heavy syllables are the closed syllables CVC, CVG, CCVC and the open CCVV, CVV and superheavy syllables are the closed CVCC, CCVCC, CVVG and CVVC. Having this distinction in the syllable weight implies that this dialect is a quantity sensitive language and that the heaviest syllable is prioritised to receive stress. The table below gives examples of syllable structure; it is based on the template $C^0{}_2VC_2{}^0$.

Table 3.1: Syllable Template in Libyan Arabic

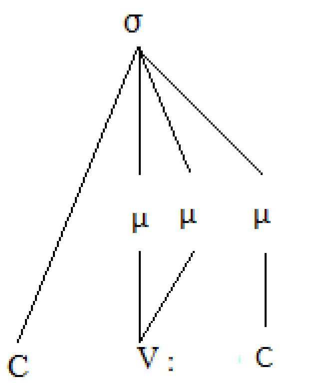
Structure	Item	Gloss
CV	/malik/	*king*
CVV	/xu:/	*brother*
CVVC	/da:r/	*bedroom*
CCV	/muʃ.kla/	*problem*
CCVV	/bke:/	*cry*
CVC	/min/	*who*
CCVC	/ɣsal/	*wash*
CVCC	/wild/	*boy*
CCVVC	/sˁħa:b/	*friends*
CCVCC	/rsamt/	*I drew*
CVG	/ʃadd/	*caught*
CVVG	/ħa:dd/	*sharp*

Some syllable types such as CVCC, CVVG and CCVCC are limited to the final position so they do not occur word internally. For example, in the CCVCC in /rsamt-ha/ *I drew her,* a vowel is inserted to break the final CC cluster, resulting in ['rsa.mit.ha]. In /'rsamt-a *I drew him*, the final consonant /t/ is syllabified as an onset of the following nucleus. In a similar way, if a CVCC syllable occurs word internally, the final cluster might be broken up by syllabifying the CC in different syllables [wil.dha] *her son* or by inserting a vowel [wi.lid.ha] *her son*; both strategies are adopted by native speakers of the dialect. In CVVG, the geminate consonant splits into a coda consisting of an initial syllable and an onset consisting of the final one and the vowel is reduced, so that [ħaːdd] becomes ['ħaddid] *specify*. In quantity sensitive languages, long vowels constitute heavy bimoraic syllables and short vowels construct a light monomoraic syllable. Closed syllables are varied amongst languages. In LA, CVC is a heavy bimoraic syllable and CVCC and CVVC are superheavy trimoraic syllables as is shown below.

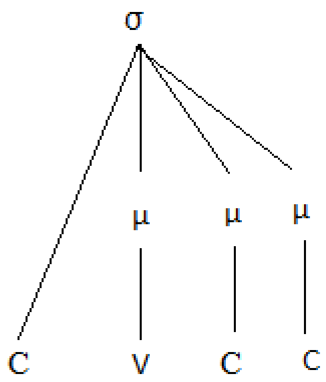
Figure 3.1: Mora Representation in LA



(4)



(5)



Stress is moveable in the three examples below: a final stressed syllable in (a), a pre-final one in (b) and initial stress in (c). The shared aspect among these items is the stressing of the heavy syllable CV: demonstrating the sensitivity of this dialect to syllable weight and consequently to mora count.

(a) buxa'la: *gready*

(b) ʔi'ma:ra *building*

(c) 'ba:xira *steamship*

3.3.3.2 **Syllable Position**

Primary stress falls in three syllable windows. It can be any syllable from the one furthest right to the antepenultimate syllable (Angoujard 1990, de Jong and Zawaydeh 1999, McCarthy 1979a, 1979b, 1980, 1994; Watson 2007, 2011; Al-Jarrah 2008). In Libyan Arabic, the superheavy final syllable constantly receives stress as a CVVC and CVCC syllable as can be seen in /buk.ki.'ʃa:ʃ/ *lizard* and /bad'delt/*I changed*. There is common agreement among researchers that in the absense of the superheavy syllable in the ultimate position, the next neighbouring heavy syllable, preferably the penultimate one, is the stress receiver as in /mus'taʃfa/ *hospital*. Watson (2011) states that if neither the superheavy ultimate nor the heavy penultimate syllables exist in the word, in most dialects, the heavy antepenultimate syllable will attract stress as in/'madrasa/ *school* in the Beirut and Damascene dialects and /'masʔala/ *issue* in LA. The table below displays how the last three syllables are stress bearers. The following type of stress is what I call transparent stress because it is phonologically predictable without the morphological structure of words affecting stress placement.

Table 3.2: Stress on Three Syllable Window

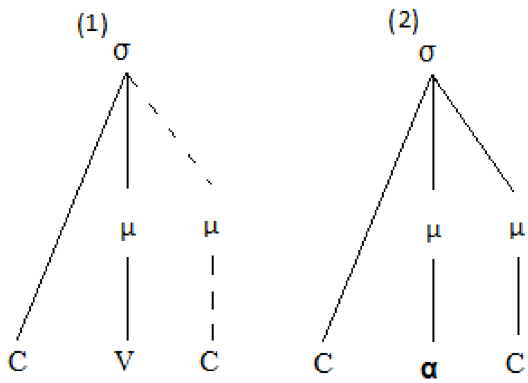
Ultimate	Penultimate	Antepenultimate
/bukiʃ'ʃaːʃ/ *lizard*	/mis'taʃfa/ *hospital*	/'masʔala/ *issue*
/bnaj'jaːt/ *girls*	/mis'tawsif/ *clinic*	/'ħaraka/ *move/*
/kurra'saːt/ *note books*	/mis'taʔmil/ *second hand*	/'ʃarika/ *company*
/ħuw'waːt/ *fisherman*	/ħwa'zitkum/ *your farm*	/'ʔabadan/ *never*
/duk'kaːn/ *shop*	/ʃi'baːni/ *elderly man*	/'tˤalaba/ *students*
/mandaliːn/ *clementine*	/dar'buːka/ *drum*	/'maθalan / *for example*

It is said that a CVC syllable is not heavy in the final position and that is why it is excluded in most Arabic dialects (McCarthy 1979, 1981; Zec 2011). The irregularity and variation of the CVC weight in languages is demonstrated cross-linguistically, as in Goroa stress, Central Alaskan and Pacific Yupik (Rosenthall and van der Hulst 1999; Zec 2011) in which the weight of the CVC syllable is a language specific feature. However; in LA, CVC is treated as a heavy syllable in the final position iff it falls in the environment of a light CV in disyllabic words and under a particular quality of its peak. Otherwise, it would not be considered as a heavy syllable in the final position.

3.3.3.3 **Developing Algorithm for Libyan Arabic Stress**

Before setting up the algorithm that can account for stress, some generalisations and facts should be laid out. In the figure below, the difference lies in the nucleus; in LA, the coda position obtains weight by its position which assigns the weight to the post-nuclear consonant as in (1) but the CVC in (2) acquires weight via the influence of the preceding vowel assigning weight to the consonant which follows it. The distinction lies in the observation that the former is not heavy in the final position while the latter is heavy in both final and non-final positions which means that the weight of the CVC is inconsistent in the final position and it is restricted to specific phonological contexts. For more explanation, see section (3.3.5.2).

Figure 3.2: Preliminary Representation of Final CVC



It is worth mentioning that the unstressed final vowel in a pattern such as CV.CVC can be either a genuine vowel as in /'malik/ *king* and /'ħakim/ *referee,* or an epenthetic vowel as in /'ħabil/ *rope* or /'buriʒ/ *bridge*. However, regardless of the status of the vowel in the final CVC, the vowel would not attract stress if it is not low. One might claim that stress assignment takes place before the epenthesis in a 'CVCC structure as it is the only syllable available and is followed by the epenthesis process that leads to the creation of another syllable, 'CV.C**V**C, as can be seen below.

/ħabl/→/' ħabl/→['ħab**i**l]

However, the above claim does not apply in words like /'ruʃin/ *window* or/'muriʃ/ *glass*, where the vowel in the final CVC is not an epenthetic vowel and is available in the underlying form. Similarly, words like /xa'bar/ *news*, /ʃi'ʒar *trees and* /ma'ħal/ *shop* illustrate the same point. The final syllable is available in the underlying form. Therefore, the proposal in this study is that, firstly: the epenthetic vowel is most likely to be the high vowel (Owens 1984; Abumdas 1985, Al-Ageli; Hayes 1995) as it is considered a less marked epenthesised vowel because of its low sonority (de Lacy, 2007). Consequently, it would not be a stress bearer because (a) epenthetic vowels repel stress (b) the quality of the vowel determines stress assignment based on its environment. Genuine vowels in the final CVC syllable will receive stress if the quality of the vowel allows it. This point will be expanded upon later in the chapter[7].

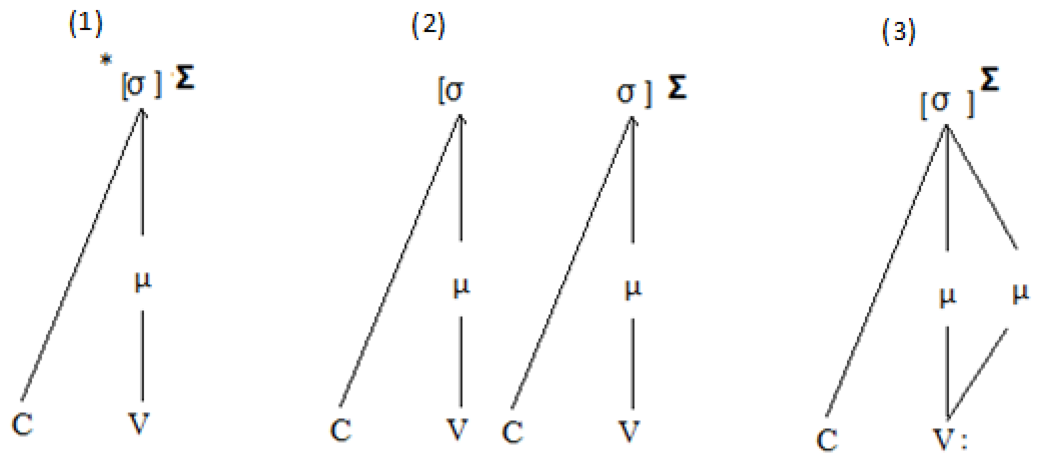
However, in a verb like /'jiktib/ *he writes*, the penultimate syllable receives stress. The scenario is as follows: the underlying form is /'katab/ and the vowel in the penultimate syllable is deleted, giving /'ktab/ *he wrote* (Al-Ageli, 1995). I will not treat /ji/ as epenthetic segments. In order to derive the present form, the prefix /ji/ is attached giving */'jiktab/. One additional process is the raising of the low vowel in the ultimate syllable to repel/shift stress to the penultimate syllable, resulting in the surface form /'jiktib/. This form is evidence that final syllables in disyllabic words cannot receive stress unless they are low vowels.

'katab→ 'ktab→/ji-k'tab/→ /ji-k'tib/→ /'jiktib/

[7] There are exceptions when an epenthetic vowel might receive stress as in /ʒa'bilha/ *he brought for her*.

Another observation is that CV and CCV cannot stand alone; these two structures have to be a part of the content word because of the minimal word requirement (Hayes 1995). It requires that each word consists of at least two moras. Therefore, a degenerate foot which is composed of one light syllable is not permitted. There is a strong ban in this dialect on building a degenerate foot, so a light syllable with one mora is unparsed into a foot.

Figure 3.3: Feet in LA



In LA, the exclusion of the final element goes beyond the final consonant to include the final syllable (Al-Ageli 1995). Hyman (1977) states that stress is not stronger in the final position compared to the pre-final position, although one of its properties is specifying the word edges, the reason for which is that it may undergo deletion or loss as result of phonological process or historical changes. The avoidance of stressing the final syllable is one of the devices adopted in the assignment of stress in LA. Moreover, the exclusion of the final syllable in LA will result in stressing the third syllable from the right if it is a left-headed foot.

← →

(σ' σ) <σ> (σ' σ) <σ>

This raises the problem of directionality in the structures below, since either the antepenultimate syllable is the stressed one if the syllables are parsed from right to left or the pre-antepenultimate one is stressed if the syllables are parsed from left to right. In LA, the direction of parsing is from right to left (Al-Ageli 1995) because the primary stress does not go beyond the antepenultimate syllable. If the direction of the foot construction starts from left as illustrated below, the pre-antepenultimate syllable receives stress.

←   →

σ (σˈσ) <σ>   (σˈσ) σ <σ>

Parsing from right to left resolves the problem of assigning stress beyond the antepenultimate syllable in four-syllable words. However, in polysyllabic words, End Rule Right supports the stress application by retracting stress to the right edge, in order not to go beyond the antepenultimate syllable as is shown below.

```
       *
  *    *
(σσ) (σσ)<σ>
```

Starting parsing from the right with a head on the left yields a left-headed foot and parsing from the right with a head on the right gives a right-headed foot. Al-Ageli (1995) states that the prominence peak occurs takes place on the left edge of the foot. My analysis, later on, will not argue against what Al-Ageli found but it rather simply raise questions and try to explain how this dialect has a trochaic type of foot and has forms which receive stress on the final position. On the face of it, it appears as if the dialect accepts both types of foot.

Internally, LA has only one type of foot and having a final stressed syllable does not mean having an iambic foot, but rather it is a result of other phonological processes which will be discussed later in the chapter.

3.3.3.3.1 The Libyan Arabic Stress Algorithm

It is observable that stress is applied smoothly on the potential stress locations, showing very transparent and predictable patterns in illustrated in table (3.2). The heaviest syllable is the stressed one unless it is exposed to unexpected factors which will be referred to later on in this chapter.

To assign stress on to LA words, the following parameters are required:

a- It is a quantity sensitive dialect.

b- The heavy syllables are CVC and CVV structures and superheavy syllables are CVVC and CVCC structures.

c- Avoid stressing the final syllable.

d- Binary bounded feet are constructed.

e- Degenerate feet are not permitted.

f- The syllables are parsed into feet from right to left.

g- The position of the foot headedness is on the left

h- The End Rule assigns the main stress to the right.

Based on these parameter settings, it is possible to derive the LA stress algorithm[8] for the words in table (3.2).

[8] The algorithm is based on Al-Ageli (1995).

1- Project the syllable nucleus onto the baseline.

2- Accent all heavy and superheavy syllables and make the last syllable extrametrical if it is not superheavy.

3- Build binary bounded feet from right to left on the baseline. The two permitted feet are (LL) and (H) but a (H L) foot is not permitted because it is a trimoraic foot; the final consonant in superheavy syllables is therefore excluded from the computation in order to create a bimoraic foot (if there is a single light syllable left over at the end of the parse, no foot is built).

4- Build trochaic feet from right to left on the first line.

5- Apply End Stress at the rightmost position on the second line.

Transparent stress is considered unmarked, as it follows the predictable phonological patterns. The stressing procedures will be illustrated in the words below:

- **Superheavy ultimate stress:**

```
              *                            *
        *     *                        *   *
    _  (*)   (*)                      (*) (*)
   bu . kiʃ.  ʃá:ʃ                    ki  sá:n
     Lizard                          wine glasses
```

- **Heavy penultimate stress:**

```
         *                          *
     *   *                      *   *
    (*) (*)                    (*) (*)
   sfan  ná: <ri>              mix til <fa>
     carrot                    different
```

- **Heavy or light antepenultimate stress:**

*	*
*	*
(*)	(* *)
$\overline{\text{mu}}$ dar $\overline{\text{ri}}$ <sa>	ʃa ri <ka>
teacher Fem	*company*

3.3.3.4 **Stress, Geminates and Length**

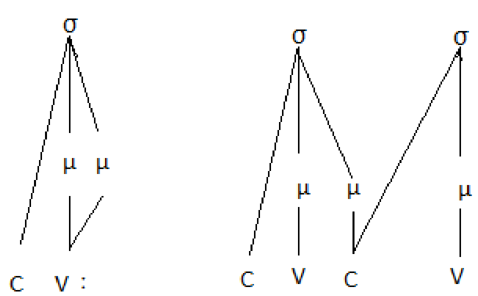
A part of transparent stress is the interaction between geminate consonants and length with stress. Hayes (1995) and Davis (2011) make a distinction between the bimoraic CVV, CVG (i.e. geminate consonant) and the monomoraic CVC, CV. Tranel (1991), however, disagrees with this distinction and assumes that quantity sensitive systems treat geminate coda consonants as any other codas. Let us examine the case in LA.

Vowel quantity is an important factor in determining stress. Long vowels usually attract stress. For example, in /ru'zaːta/ *almond syrup* and /ʃi'baːni/ *old man*, the penultimate syllables are bimoraic. However, in /gar'ʒuːma/ *throat* and dar'buːka *drum*, both the penultimate and antepenultimate syllables have an equal number of moras. So in the antepenultimate CVC and in the penultimate CVː, the vowel represents a mora and the length has another mora. Although both syllables are weight-equal, the penultimate one is selected. Isthis because of the length or because of the syllable position? The structures in the last two examples are swapped in /tˤaː'gij.ja/ *hat*, in which the penultimate syllable is still the stressed one. Nevertheless, the long vowel occurs in the preceding syllable. In fact, it is a combination of quantity sensitivity (i.e. syllable weight) and the End Rule Right which prefers the rightmost position (i.e. syllable position).

So if vowel quantity plays an important role in determining stress placement, why does the antepenultimate syllable not receive stress since it has a long vowel? The vowel's inability to attract stress may be due to the geminate consonant's influence. Geminate consonants generally attract stress to the preceding syllable (Davis 2011).

However, in /ʃig'gaːga/ *pot,* or /sfan'naːri/ *carrot,* the syllables which precede the geminate consonants hypothetically have to be stressed. Conversely, in the above examples, the syllables which follow the geminate consonants are the ones receiving stress. Although the vowel quantity and the geminate are significant in determining stress placement, it seems that the penultimate position has a stronger impact on stress assignment. So neither the length in the antepenultimate syllable in /tˤaː'gij.ja/ / *hat,* nor the antepenultimate syllable which precedes the geminate consonant in /ʃig'gaːga/ *money pot* entice stress assignment. It seems that the CVG structure does not influence stress, because stress is sometimes attracted to the geminate consonant and sometimes not.

Figure 3.4: Geminate Consonants



However, it seems there is a relationship between the geminate consonants and length, where by the stress maintains its penultimate position. Considering the pairs below, geminate consonants and length cannot function together. So in the absence of a long vowel, the consonant which follows the vowel is doubled to compensate for the lost length and consequently delivers a new meaning.[9]

Table 3.3: Geminate Consonants

'CVː.CVC	Gloss	CVC.CVC	Gloss
/'gaː.jel/	*has said*	/'gaj.jel/	*had a nap (mas)*
/'waːsˤul/	*receipt*	/'wasˤ.sˤul/	*gave a lift (mas)*
/'waːguf/	*stand (mas)*	/'wagguf/	*stopped someone*
/'tˤaːjeb/	*cooked*	/'tˤajjeb/	*Kind*
/'ħaːsˤul/	*trapped*	/'ħasˤsˤul/	*obtain*

3.3.4 Opaque Stress

There are three different groups of items in the table below. In each group, stress is assigned to the light antepenultimate syllable. Having the same stress placement does not mean that the items follow the same patterns to derive stress; in fact, each group has different patterns but they result in the same stress placement, on the light antepenultimate syllable. These stress patterns are considered to be marked and unpredictable because they do not undergo the conditions of quantity sensitivity systems.

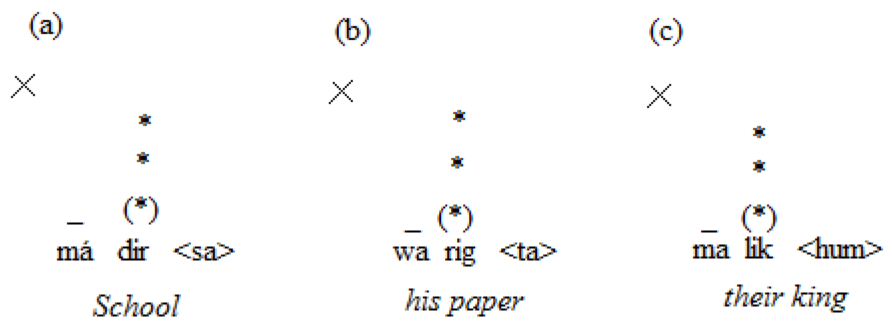
[9] L2 learners of Japanese sometimes face difficulties in perceiving geminate consonants; so they transfer stress to the following syllable after deleting the coda of the geminate (Motohashi-Saigo and Hardison, 2009).

Table 3.4: Opaque Stress

Light Antepenultimate (a)	Light Antepenultimate(b)	Light Antepenultimate (c)
/'mazirʕa/ *farm*	/'bugirta/ *his cow*	/'malikhum/ *their king*
/'mafurma/ *mincer*	/'faqirta/ *his vertebrae*	/'ħakimhum/ *their referee*
/'makinsa/ *hoover*	/'xidimta/ *his job*	/'wilidhum/ *their son*
/'maħirma/ *scarf*	/'salita/ *his hair style*	/'ktabilhum/ *he wrote to them*
/'maʃinga/ *hang*	/'basimta/ *his smile*	/'rsamilkum/ *he drew to you*
/'madirsa/ *school*	/'warigta/ *his paper*	/'binithum/ *their daughter*
/'maɣisla/ *laundry*	/'ħafilta/ *his party*	/'tamirna/ *our dates*

Applying the above algorithm produces incorrect stress assignment, as shown below in Figure 3.5 because algorithm stresses the heaviest syllable in the words. However, the items below are stressed on the light antepenultimate syllable; neither the syllable position nor the syllable weight are the stress triggers, so stress skips the heavy penultimate syllable and goes to the light antepenultimate one.

Figure 3.5: Application of Algorithm



3.3.4.1 **Stress with Syncope and Epenthesis**

In contrast to LA patterns, the light penultimate syllable in Cairene accepts stress in /mad'rasa/ *school* (McCarthy 1979b), although it is preceded by a heavy one. In Damascene, the heavy antepenultimate syllable in /'madrasa/ *school* is the stress bearer. The justification for stressing the antepenultimate syllable in /'madrasa/ in Damascene (Halle and Kenstowicz 1991) is the influence of syllable weight and the reason for stressing the light penultimate syllable in Cairene is moderately clear because of its position, since the penultimate one is phonologically strong because it occurs pre-finally; therefore, it is not under the threat of exclusion from the stress computation. However, in some cases, in Libyan Arabic, it seems that the antepenultimate syllable is favoured over the penultimate one. So in the word /'ma.dir.sa/ *school*, although the penultimate syllable is the heaviest one, stress skips to the light antepenultimate syllable.

Table 3.5: Stress in Different Dialects

Cairene	Damascene	Tripolitanian
CVC.**CV**.CV	**CVC**.CV.CV	**CV**.CVC.CV
mad.'ra.sa	'mad.ra.sa	'ma.dir.sa

Considering the word /'madirsa/ which belongs to group (a) of items in table (3.4), it can be noticed that the prefix /ma/ (which changes some verbs to nouns) is a stress bearer, while the penultimate syllable in the stem, regardless of its weight, is unstressed. First, it can be noticed that both affixes and stems are potential stress receivers. However, the question is why do the /dir/, /kit/, /kin/ and the other CVC penultimate syllables in the table below do not attract stress? Recollect that this language depends on syllable weight. Perhaps the stress placement occurred before any other phonological processes such as epenthesis or syncope (Watson 2011, Kager 1999, McCarthy 2008, Kiparsky 2000).

Table 3.6: Group (a) CV.cvc.cv

Item	Prefix	stem	Consonantal root	Gloss
/mak.tba/	Ma	katab(a)	*k-t-b*	*library*
/makinsa/	Ma	kanas(a)	*k-n-s*	*hoover*
/mafurma/	Ma	faram(a)	*f-r-m*	*mincer*
/maħirma/	Ma	------	*ħ-r-m*	*scarf*
/maʃinga/	Ma	ʃanag(a)	ʃ*-n-g*	*gallows*
/madirsa/	Ma	daras(a)	*d-r-s*	*school*
/maɣisla/	Ma	ɣasal(a)	*ɣ-s-l*	*laundry*

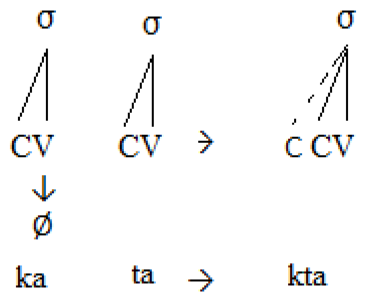
The noun /madarasa/ [10]is composed of the consonantal root d-r-s which forms the verb /daras(a)/ *study,* combined with the prefix /ma/.

(ma) morpheme + darasa (stem *verb*) → madarasa (noun)

Following Al-Ageli (1995), LA has a tendency to create consonant clusters in the onset position, so a verb like /kataba/ *wrote* is altered to /ktab/ by deleting the vowel as shown below. According to Watson (2011), Arabic dialects differ in which vowel can be deleted; some dialects delete only high vowels and others delete all vowels regardless of their quality.

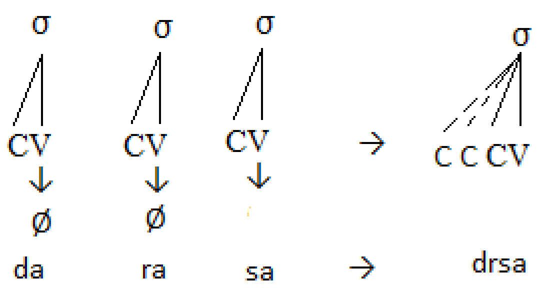
[10] /h/ in /madrasah/ is a historical /h/ that is deleted phonetically but it appears in the orthographic representation.

Figure 3.6: Vowel Deletion



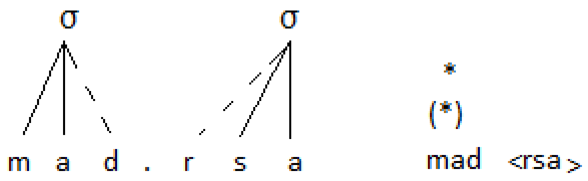
The scenario here is that the consonant combination is derived by applying the vowel deletion rule followed by the Onset Incorporation Rule. Brame (1970 p. 138) and Al-Ageli (1995 p. 120) state that the condition for deleting a vowel is that the vowel has to be a short one in an open syllable preceding a CV syllable. So the short vowel in the verb /'darrasa/ cannot be deleted while in /'kataba/ or in /'darasa/ the vowels are deleted as below.

Figure 3.7: Cluster Formation



The vowel deletion rule says that short vowels in Class I verbs, which occur in open syllables before CV type syllables are deleted. The deletion of the vowels results in tri-consonantal clusters, and because the Onset Incorporation Rule requires that segments have to be licensed by a higher prosodic node, they are combined with the following nucleus. In order to compose the noun (school), the prefix /ma/ is attached to /drsa/. Three consonants cannot be attached to the following vowel as onsets, because this dialect allows only two consonants in the onset position. Therefore, onset maximization will not allow the segment/d/ to be maximized and it will be sent to the preceding vowel by applying the coda formation rule giving /mad.rsa/. When the above algorithm is applied to /madrsa/, stress assignment is placed on the heavy syllable as illustrated below:

Figure 3.8: Stress Assignment



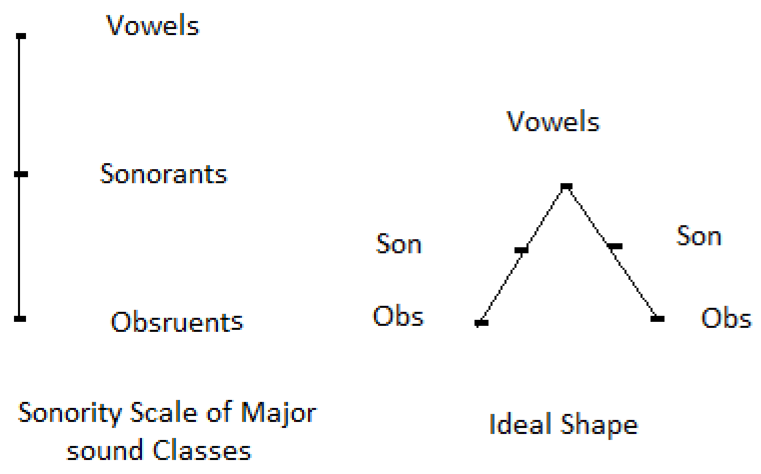
The middle three consonant cluster is proved in this dialect as in /nik.tbu/ *we write*. In a /ktb/ sequence, the /tb/ are attached to the following syllable peak as onsets while the /k/ is attached to the preceding nucleus as a coda. This type of sequence is attested and accepted; however, the /drs/ sequence is not tolerated even if the consonants are separated into different syllables. Comparing the two sequences /ktb/ and /drs/, it can be observed that the first sequence consists of obstruents while the second sequence includes both sonorants and obstruents. This dialect is a well-known for tolerating sonority violations at word edges as in./rasm/ *drawing*; clusters at the initial edge and clusters at the final edge of the word are sometimes accepted despite the requirement of the sonority sequencing principle. According to Al-Ageli (1995), in terms of sonority, this dialect deals with the major groups of sounds: vowels, sonorants and obstruents, rather than grouping them into sub-classes, so the vowel is the peak and all sonorants have an equal level and obstruents also have an equal level. In other words, sequences of sonorants or sequences of obstruents in inter-word positions do not violate the Sonority Sequencing Principle (SSP)[11]; however, if a sequence is made up from sonorants and obstruents as in /drs/, the SSP will be violated because the sonorant

[11] Selkirk (1984)'s SSP says that the sonority of the consonants must increase until it peaks and decrease again.

occurs after the obstruent. Contrasting the sequence /ktb/ in /nik.tbu/ *we write* with /drs/ in /ni.dir.su/ *we study*, it is obvious that there is an inserted vowel in the latter example in order to satisfy the SSP since the SSP is active word-internally among different sound classes and it can be suppressed within one group (e.g. sonorants) as in the former example. Therefore, there is no need to insert a vowel in /nik.tbu/ to become /ni.kit.bu/[12] but both forms are acceptable in this dialect. It is necessary to insert a vowel in /ni.dir.su/, */ nid.rsu/.

According to Selkirk (1984, p. 116), vowels represent the topmost of the sonority scale and occupy the peak of the syllable; all following or preceding sounds have to be reduced in their scale. So the perfect shape which satisfies SSP is a sequence of an obstruent and sonorant in the onset position and a sequence of a sonorant and obstruent in the coda position.

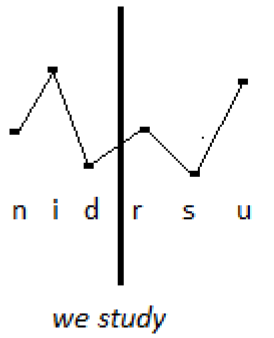
Figure 3.9: Sonority Scale



[12] It is noticed in this dialect that both forms are pronounceable /ni.kit.bu/ and /nik.tbu/. In a cluster made of three obstruents, vowel insertion is varied among speakers.

Looking at the following diagrams, it is evident that the scale is interrupted in /rs/ while it is constant in /tb/.

Figure 3.10: Unacceptable Sonority Profile



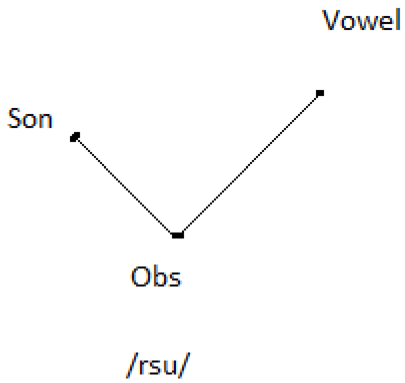
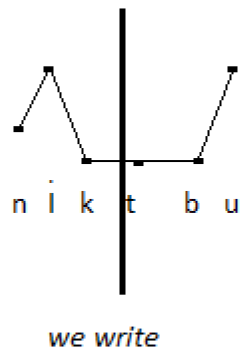
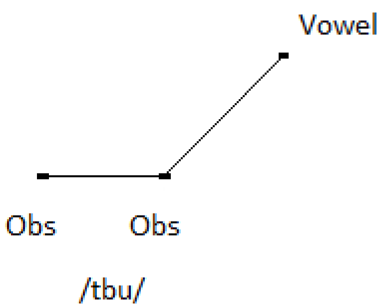


Figure 3.11: Acceptable Sonority Profile





Therefore, the /drs/ string which forms the stem of the target word has to be repaired in accordance with the dialect conditions. The unsyllabified segment can occupy the position of either the onset or the coda, based on language specific requirements (Ito 1986, 1989). Farwaneh (1995) states that the Iraqi dialect creates heavy syllables by taking the unsyllabified element as a coda, whilst epenthetic vowels accept stress as in /gu.'lit.la/ *I told him*. However, the vowel in Libyan Arabic is inserted in order to syllabify the maximized onset /r/ as a coda; and the coda /d/ of the preceding syllable is forced to be syllabified as the onset of the following epenthetic nucleus by the Onset First Principle, but the vowels repels the stress giving the following structure.

Figure 3.12: Vowel Insertion

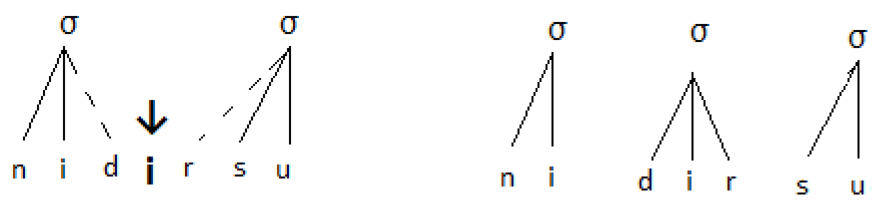
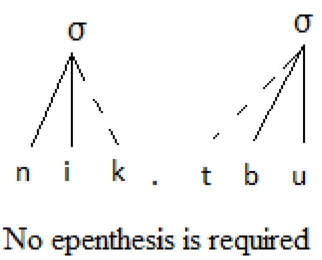


Figure 3.13: No Insertion



Ordering of Interaction of Stress with Syncope and Epenthesis

1- **Vowel deletion:**

ø ø
da ra sa → drsa

2- **Word formation:**

ma+verb --> noun: madras(a)

3- **Syllabification:**

mad. rsa

4- **Stress Assignment:**

*
(*)
'mad <rsa>

5- **Epenthesis:**

'madirsa

The question which is worth asking is why stress cannot be shifted to the heavy penultimate syllable /dir/ in order to satisfy the quantity sensitive parameter. The reason for is that there are two types of epenthetic vowels. One cannot be a peak of stressed syllable and the other type is a potential stress bearer. The latter type is post lexical because it is inserted after stress assignment and it is not recognized by stress assignment as other vowels are. Post lexical epenthesis is prompted by the sonority and constituency requirement. In contrast, lexical epenthesis is applied before stress assignment; therefore, it is observable by stress. It is triggered by the well-formation rules as in /bug.ˈrit.ha/ *her cow* (Kiparsky 2000, Piggot 1995). More details about lexical epenthesis are in section 3.3.4.2. Therefore, the post-lexical epenthetic vowel in /dir/ is unable to attract stress since the epenthesis occurs after stress application.

Despite the fact that CV syllables in quantity sensitive systems are not given priority to be stressed if the word contains other heavier syllables, it is demonstrated up in group (a) that the penultimate CVC does not accept stress because it is not inherently heavy, since the nucleus is an epenthetic vowel. This syllable is created from breaking up an unacceptable cluster and the original stressed syllables preserve their status of being stressed, even after demoting the number of mora by parsing its coda as an onset of the following nucleus.

In the table below however, the penultimate CVCs accept stress because they are innately heavy in their uninflected forms. So stress is not assigned to the first syllables because of their light weight and stress is not applied to the third heavy CVCs because final syllables are dispreferred as stress bearers in this dialect and if they receive stress it will only be under specific conditions which will be discussed later in this chapter. So the following items are different from those previously discussed since they represent a transparent predictable quantity-based system while group (a) in Table 3.4 shows an interaction of stress with epenthesis and syncope which results in stress being preserved on the light antepenultimate syllable (i.e. a marked and unpredictable pattern) (Broselow 1992; Farwaneh 1995; McCarthy 2007a).

Table 3.7: Predictable Stress

Items	Gloss
/ʕa'bumber/	*almond biscuit*
/xi'mantiʃ/	*stuff*
/mu'handis/	*engineer*
/di'mangil/	*idiot*

3.3.4.2 **Affixes Determine Stress**

Another case of syncope and epenthesis interaction with stress is found in LA, which results in the light antepenultimate syllable being stressed. It is similar to group (a) in Table 3.4, since the dispreferred syllable which occupies the penultimate position is heavy and the light antepenultimate one retains the stress after the application of other processes. The difference between group (a) such as in /madirsa/ and group (b) such as in /'bugirta/ *his cow* is that the latter is templatic because of the suffixation operation. Group (c) such as in /'malikhum/ illustrates the influence of the stem; stems can block or allow reapplication of stress whereas the items in group (b) exhibit influence of the suffixes; some suffixes can retract stress and others do not.

In group (b) in Table 3.4, let us first make a distinction between /'bugirta/ *his cow* and /bug'ritha/ *her cow*. Why does the algorithm derive the place of stress correctly in the second item but incorrectly in the first? The same stem is used, but different types of affixes are attached to the stems to derive these forms. The possessive suffixes are of two types: feminine and masculine. The masculine suffix is /a/ and the feminine is /ha/. The sequence of consonants preceding /ha/ will affect stress assignment. Secondly, the stem is an outcome of deletion processes, so /bagara/ CVCVCV is the input. Following Al-Ageli (1995), in the syllabification of CV sequences, the short vowel which is followed by the CV is subject to deletion.

Figure 3.14: Vowel Deletion

$$\mathrm{CV}\ \mathrm{C}\underset{\substack{\downarrow\\ \emptyset}}{\mathrm{V}}\ \mathrm{CV} \rightarrow \mathrm{CVC.CV}$$

In LA, the CVC.CV structure is very frequent and unmarked compared to that of CV.CVC. Most words which represent the CVCVCV structure undergo deletion, while words which have CVC.CV structures as their input are not exposed to deletion or epenthesis processes, as illustrated by /'bas.ma/ *smile* and /'ħaf.la/ *party*.

For example, the item /bagara/ becomes /'bugra/ because of the deletion of the second short vowel and the raising of the low vowel to a high back vowel (raising does not apply in all items). Stress is applied on the penultimate syllable because a binary trochaic foot is built, resulting in the correct stress placement after the exclusion of the final light syllable /ra/. All the ingredients are ready: the stem and suffixes to form the derived structure.

Figure 3.15: Word Formation[13]

bugra + ta → bugrta

bugra + tha → bugrtha

The problem with the above items is that three and four consonantal clusters are not allowed in LA. The difficulty is not how to find a solution for clusters in LA because the logical answer is epenthesis, but rather how can we decide where to insert a vowel. It has been found that the SSP plays an important role in deciding the place of epenthesis in order not to violate its requirement. In the three consonantal cluster'srepresentation, the SSP is not violated when the vowel is inserted in two different places, as shown in (3.16). However, if the vowel is inserted after the first consonant it gives an incorrect output. When it is inserted after the second consonant, it does not violate SSP and gives a correct output. Comparing them with four consonants, SSP is violated only once when a vowel is inserted after the first consonant, but any insertions after the second or the third consonant do not incur violations. The only insertion that yields a correct result is the one inserted after the second consonant (see below for demonstration). Although insertion after the third consonant does not give the actual form, it satisfies the SSP. It can be said that there is no influence of SSP on the current case. In fact, it is the directionality parameter (Ito 1986; Kenstowicz 1994) that has

[13] /t/ sound in /bugr**t**a/ is a trace of the historical /h/ which appears after affixation or in connected speech-it is not a part of the suffix (see section 2.3.5.1 for explanation).

an influence, not only on the metrical structure but also on the syllabification process which involves epenthesis. Parsing starts from right to left. Therefore, the difference between the masculine and feminine suffixes is not only syntactic but also phonological because of the cluster size. The insertion is after the second consonant from the right and it also has to be in accordance with the SSP requirements.

Figure 3.16: Vowel Insertion in Three Consonantal Cluster

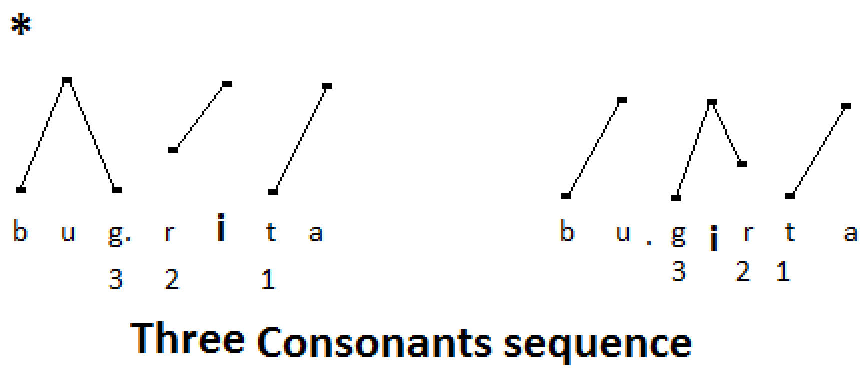
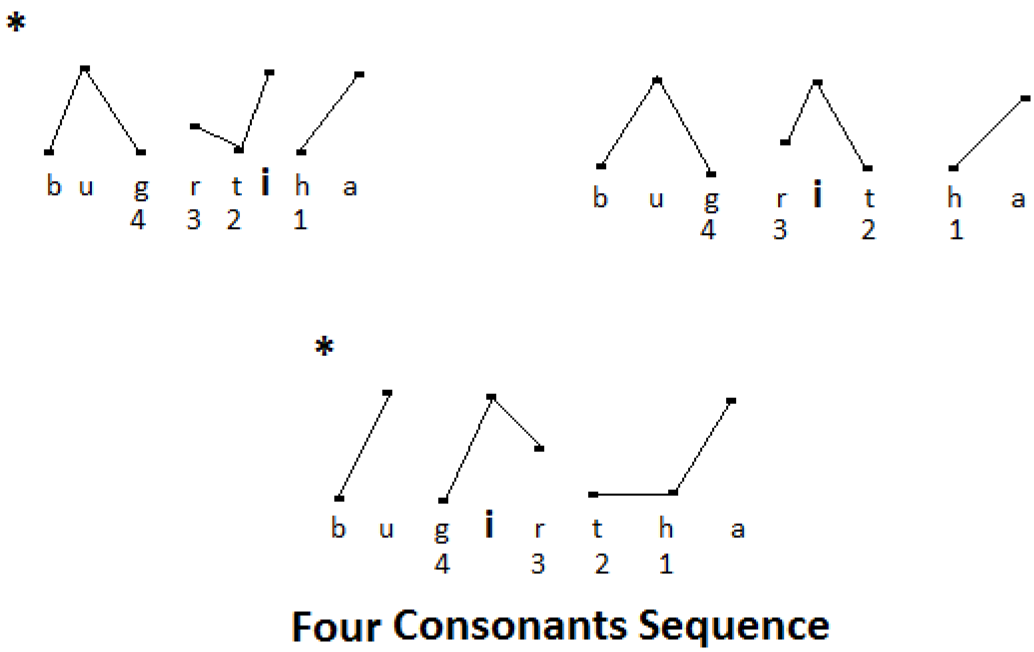


Figure 3.17: Vowel Insertion in Four Consonantal Clusters



Returning to stress assignment, the scenario here is that epenthesis is applied to both of them, resulting in /'bugirta/ *his cow and* /bug'ritha/ *her cow*. This dialect accepts two consonants in onset or coda positions. So why do we not break the cluster simply by syllabifying them as codas or onsets instead of inserting vowels? Why are the following structures not acceptable in LA?

a) *bugr.ta ~ bug.rta

CV**CC.C**V ~ CV**C.CC**V

b) *bugr.tha~ bug.rtha

CV**CC.CC**V~CV**C.CCC**V

In (a), the trigger for epenthesis is the SSP requirement, because it is violated in the sequence of obstruent-sonorant in the coda /bu**gr**.ta/; moreover, the CVCC structure is restricted to word final positions. The sequence of sonorant-obstruent /bug.**rt**a/ causes a violation as explained above, but the location of the epenthetic vowel is determined by the directionality parameter. A vowel is epenthesised post lexically after stress assignment. Therefore, post lexical epenthetic vowels do not have the right to attract stress like other vowels.

In (b), the trigger for insertion is not the SSP condition but rather to requirement to create a well-formed structure. Having a medial CVCC structure is avoided as is illustrated in **/bugr**.tha/. The tri-consonantal cluster in /bug.**rth**a/ is not possible in LA. It is the aim of creating a well formed structure that promotes insertion. It is applied lexically before stress assignment and therefore it is recognized by stress. Thus, the vowel in /'bug**i**rta/ *his cow* lies outside the stress computation but the vowel in /bug'r**i**tha/ is included in it (Piggot 1995; Al-Ageli 1995; Elfiner 2011; Kiparsky 2003).

Ordering of Stress and Affixation

1- Affixation

bug.rta--------------------bug.rtha

2- Stress assignment

*

(*)

'bug.<rta>-----------------blocked

3- Epenthesis

'bu.gir.ta------------------bug.ritha

4- Assignment/ Reassignment of stress

*

(*) (*)

Blocked bug.'rit. <ha>

3.3.4.3 **Stems Determine Stress**

However, if we consider the words /'kabiʃkum/ *your ram* and /'malikhum *their king,* which both receive stress on their light antepenultimate syllables, the situation gets complicated because the stressed syllables are inherently light so the stress placement can not be argued to be a result of interaction of stress with syncope and epenthesis. Why do the light antepenultimate /ka/ and /ma/ receive stress? Although the penultimate syllable is the most preferred location and it is hypothetically heavy in the above words, the syllables /biʃ/ and /lik/do not attract stress. The assumption here is that the status of CV.CVC as a disyllable is quite ambiguous because on one hand, the pre-final syllable in CV.CVC structures attract stress yet on the other hand, the final syllable can also attract stress but only under specific conditions which will be discussed later on in this chapter.

Words like /kabiʃ/ *ram* and /malik/ *king* are uninflected forms and receive stress on the light penultimate syllable. The CV.CVC structure such as is seen in /kabiʃ/ causes a problem because this dialect excludes the final syllable, so /biʃ/ is not visible for stress. It also bans degenerate feet from being constructed because of the minimal word size requirement, so the /ka/ syllable cannot build a foot alone. In a trochaic dialect, (L H) or (L) feet are not acceptable. There is a conflict in LA between the form of this CV.CVC word structure, the extrametricality condition CV<CVC> and the restrictions on foot formation *(CV)<CVC>. Hayes (1995 P. 110) states that "a phenomenon that results from their conjunction: words of certain shape become unstressable…such words find a remarkable range of outcomes across (and even within) languages…It appears that languages solve the contradiction in ad hoc fashion." An example of these words can be found in LA. Cross linguistically, different strategies are used to resolve this problem: (1) the vowel in the light syllable CV is lengthened to be capable of forming a foot; (2) the combination between the degenerate foot and the extrametrical syllable will form an illegitimate foot though this strategy is very rare in languages (L <H>) or (3) the incorporation strategy is joined with the shortening strategy in order to repair the outcome so the (LH) foot will be altered to (LL), aiming to have a legitimate foot. (4) Another strategy is the deactivation of extrametricality in disyllabic words, which allows the final syllable to be stressed or (5) appealing to other morphological levels, so the word is unstressable at level 1 but the same word can receive stress at level 2 when affixes attach to it (Liberman and Prince 1977, Hayes 1995, Kager 1999).

In LA, the final syllables in /kabiʃ/and /malik/ are excluded from stress computation for the following reasons; they are not superheavy so are not able to attract stress and they do not satisfy the final CVC condition (see section 3.3.5.2). However, to avoid a case of an unstressable word, extrametricality is suspended in disyllabic CVCVC words in order to form a canonical foot. This does not, however, mean that every CVC in a CVCVC pattern receives stress because it still has to be eligible to bear stress. The right edge shows an exception in many languages including Arabic. So the CVC syllable is light word-finally but heavy non-finally; this structure is attested in many Arabic dialects and CVCC and CVVC structures are always heavy because the final consonant is extrametrical in CVC syllables, creating a light CV in a final position and CVC and CVV in place of CVCC and CVVC respectively (McCarthy 1979, Hayes 1995, prince 1980, Hyde 2011). Excluding the final consonant in superheavy syllables will not affect the stress assignment because they remain heavy after exclusion and, by applying the End Right Rule, stressing the final superheavy syllable is guaranteed in LA. In fact, excluding the final consonant is essential to form a binary foot with superheavy syllables.

Figure 3.18: Final Consonant

$$\begin{array}{ccc} \mu\ \langle\mu\rangle & \rightarrow & \mu \\ \text{CVC} & & \text{CV} \end{array}$$

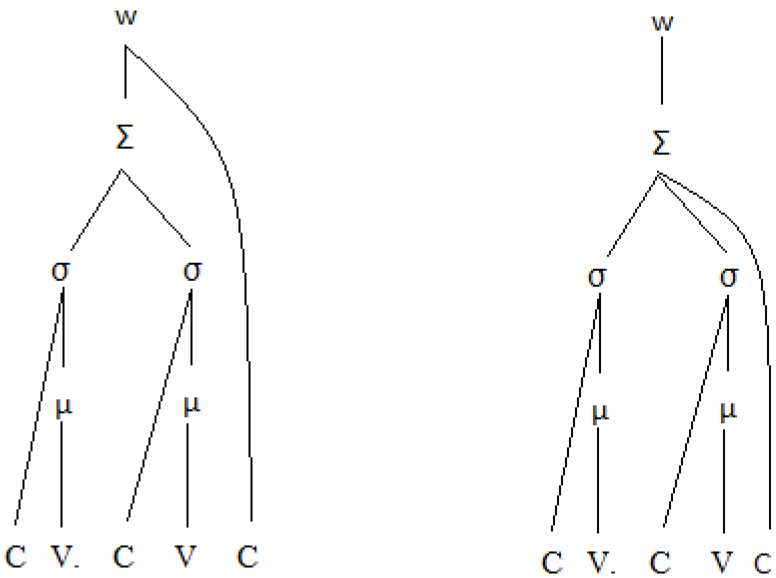
$$\begin{array}{ccc} \mu\mu\langle\mu\rangle & \rightarrow & \mu\mu \\ \text{CVCC} & & \text{CVC} \end{array}$$

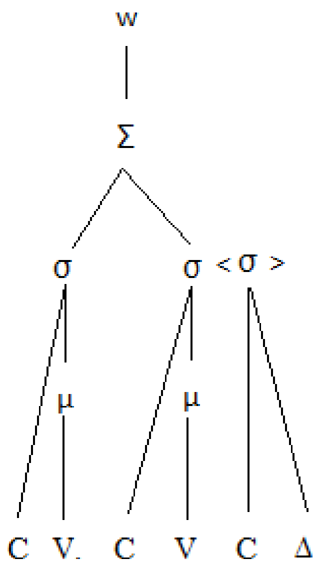
$$\begin{array}{ccc} \mu\mu\langle\mu\rangle & \rightarrow & \mu\mu \\ \text{CVV C} & & \text{CVV} \end{array}$$

The weakness of the final consonant in heavy and superheavy syllables in a word-final position is attributed to the ability of the rightmost consonant to form a degenerate syllable with an empty vowel position (Halle and Vergnaud 1979; Angoujard 1990), or it can be directly associated with the prosodic word (Al-Mohanna 2004).

Returning to the CV.CVC structure, the problem of CV.CVC has not been tackled by other researchers who analysed LA stress (Abumdas 1985; Al-Ageli 1995; Sheredi 2015) so it is left unsolved. My proposal of CV.CVC in LA, in the absence of others, is that the final consonant constitutes a syllable with an empty nucleus position. If we assume that the final consonant is attached directly to the prosodic word or to the foot, as has been explained by Al-Mohanna for the Hijazi dialect (2004, 2008), then the Strict Layer hypothesis (Selkirk 1984) is violated because it requires each phonological domain to be governed by an upper prosodic unit in order to form a prosodic hierarchy, otherwise an ill formed hierarchy would be built andthe phonological rules would consequently be blocked. Attaching a final consonant to a prosodic word results in skipping the syllable and foot domain and attaching it to the foot results in skipping the syllable node. However, assigning the rightmost consonant to a null vowel creates an invisible syllable for stress assignment and legitimises stressing the initial syllable of a CV.CVC structure. Consider the following figures:

Figure 3.19: Final Consonant Attached Directly to the Syllable or creates Syllable with an Empty Nucleus





So /malik/ receives stress on the initial syllable as demonstrated in Figure 3.20:

Figure 3.20: Empty Nucleus

```
      *
     (*       * )
  m   a    l   i  <k   Δ >
```

The word /kabiʃ/ is different from /malik/ because the underlying form is not CV.CVC but CVCC. So the solution is reachable by assuming that stress is applied before epenthesis to the only available syllable as below.

1- Stress assignment:

*
(*)
k a b ʃ
C V C C

2- Epenthesis

↓
'ka b **i** ʃ

After the above analysis, the stems' stress pattern is obtained. Looking at the stress patterns of more complex items such as /'kabiʃkum/ *your ram* and /'malikhum/ *their king*, there is no justification for appealing to any of the above mentioned strategies in order to form a canonical foot. Although the structure is changed after the addition of the suffix, the lightest syllable is still stressed, leading to incorrect assignment using the LA algorithm as shown beneath.

Table 3.8: Stems Reserve Stress

Stem	Gloss	Suffix	Gloss	Derived form	Gloss
/'kabiʃ/	*ram*	kum	*your/pl*	/'kabiʃkum/	*your ram*
/'malik/	*king*	hum	*their*	/'malikhum/	*their king*

Figure 3.21: Incorrect Stress Assignment

X
_ (*)
m a l i k <h u m>

Suffixes do not affect stress assignment and consequently do not retract the stress to the penultimate syllable (in some words including the above example). In LA, there are two types of stems: preserved and non-preserved stems. The preserved ones keep stress in the same place, even when suffixes are added to them. So these items cannot be predictable on the basis of phonological analysis. Stems which retain same stress position after they became morphologically complex must undergo word formation after stress assignment.

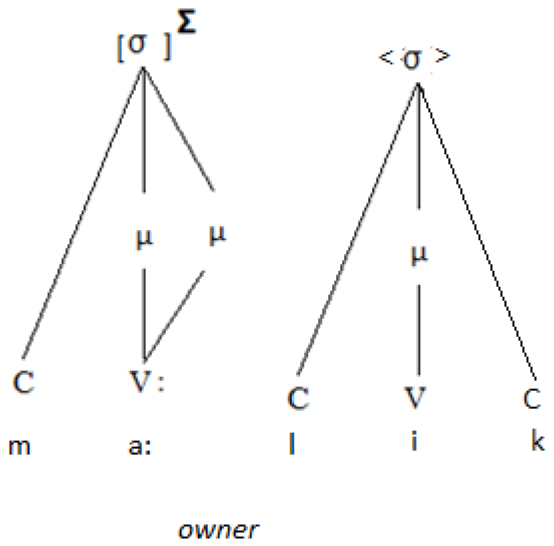
Why is stress not retracted to the heavy penultimate syllable? Stress assignment is not influenced by the affixes in the current case and it is not reapplied after affixation. However, this does not mean that LA has totally predictable stress patterns. Having the same light stressed syllable before and after the affixation process and neglecting the weight of the surrounding syllables in a quantity sensitive system is evidence for the existence of unpredictable or partially unpredictable patterns. This is particularly the case in the light of items in (2) in Table 3.9 in which stress is not fixed but is changed after affixation, so the items receive stress in their default position (i.e. the heavy penultimate syllable). In other words, there are two similar structures which differ only in stress assignment. In the table below, antepenultimate (in the first column) and penultimate syllables (in the third column) can be stress bearers based on the stem structure and by ignoring the syllable weight function. Consider Table 3.9 below.

Table 3.9: Phonemic Stress

Items (1)	Gloss	Items (2)	Gloss
CV.cvc.cvc		cv.CVC.cvc	
/'malikhum/	*your king*	/ma'likhum/	*he owned them*
/'ħakimhum/	*your referee*	/ħa'kimhum/	*he governed them*

Returning to the origin of the words above, /'malik/ *king* and /'ħakim/ *referee* preserve the stress in the same location even after the addition of the suffixes, but in /'maːlik/ *owner* and /'ħaːkim/ *governor,* stress is shifted to the right after the addition of the suffixes and the vowel shortening. This difference cannot be attributed to the effect of the suffixes, but rather it can be attributed to the influence of the vowel shortening in the first syllable, which weakens the syllable and causes the stress to be shifted. In this case, the deletion of one mora occurs in order to strengthen another syllable.

Figure 3.22: Syllabification and Foot Formation



The dissimilarity between /'malikhum/ *their king* and /ma'likhum/ *he owned them* can be found in the distinction between stress-neutral affixes and stress-shifting (Booji 1997). In /'malikhum/, the reassignment of stress is stopped because it is ordered before the affixation occurs, while in /ma'likhum/, stress is reapplied after affixation. The previous stress assignment is erased and a new stress assignment is applied.

In both stems, the phonological rule is applied before any morphological process has taken place, placing stress in the initial syllable: in CV:.CVC structures, stress is derived correctly by following the algorithm and in CV.CVC structures, it is obtained by appealing to the null vowel position as explained above. The second stage is affixation; the difference appears in the third stage when reassignment of stress is a choice determined by the stems to which the suffixes attach. If the CVCVC structure allows stress cyclicity then a recurrence of the stress position will surface. Therefore, the processis not cyclicity but rather ordering and blocking of stress application. Thus, CVCVC stems are noncyclic while CV:.CVC stems are cyclic. This contradicts Kiparsky (2002, p.10) who claims that ‘’every stem is a cyclic domain’’ but maintains that suffixes are either cyclic or noncyclic. In LA, it has been found that stems are also noncyclic after the morphological operation has occurred.

Stress Assignment on Stems

*
(* *)
m a l i <k Δ >
king

*
(*)
m a : < l i k >
owner

Affixation

*
(* *)
m a l i | k Δ + h u m
their king

m a : l i k <h u m >
he owned them

No shortening

Vowel Shortening

m a l i k <h u m >

Reassignment of Stress

Blocked

Reassignment of stress

*
(*)
m a l i k <h u m >

3.3.5 Finality in Libyan Arabic

3.3.5.1 Final CVVC and CVV

LA stress occurs in three syllable windows. It starts from the ultimate syllable up to the antepenultimate syllable. It may only go beyond the antepenultimate syllable to the pre-antepenultimate one in the presence of secondary stress in words of more than 3 syllables[14] such as /kasˌsirna'halhim/ *we broke it for them*. However, the penultimate syllable is the most chosen position and is frequently stressed in LA. It is considered to be a default position for a number of languages such as Spanish, Italian and Polish and as a fixed position for about another 77 languages. Hyman (1977), Gordon (2002), Hulst et al (2010) and Dowing (2010), in their linguistic survey, find that penultimate syllable stress is very common compared to antepenultimate syllable stress. Other cases, where the antepenultimate or ultimate syllable may receive stress, are also available under specific conditions. There are different situations where native speakers change the location of stress to the penultimate syllable. For example, stress in loan words is usually shifted to the penultimate syllable as can be seen in the Italian word /'makina/ *machine* which becomes /ma'kiːna/ with penultimate stress. Moreover, Libyan learners of English as a second language tend to shift stress from the antepenultimate to the penultimate syllable as in *'calendar* which becomes *ca'lendar* (Jleiyal 2004). If the ultimate syllable is dispreferred, under what conditions will the ultimate syllable allow stress on it?

The final position has a very critical status and it has received great attention from researchers (Hammond 1999, Kiparsky 2003, and McCarthy 1979 among others). The fundamental agreement among phonologists is that the final syllable refuses to receive stress

[14] Some researchers do not agree that there is a secondary stress in Arabic dialects (Abumdas 1985).

unless it is superheavy in most, if not all, Arabic dialects (Al-Jarrah 2011; Al Mohanna 2004, 2008; Al-Ageli 1995 among others). This means that the final position will not resist stress if it is trimoraic.

What difference can LA make between CVVC and CVV structures? Undoubtedly, the first receives stress since the trimoraic structure is obtained as in /firħa'niːn/ *happy (pl)*. When it comes to /buxa'laː/ *tight* or /ʒaː'buː/ *they brought him/it*; /ktab'naː/ *we wrote it*, the final syllable also does not repelt stress in LA. Similarly, Al-Jarrah (2011) argues that some Arabic dialects allow CVV syllables to be finally stressed if they are intrinsically trimoraic. Moreover, two categories of CVV are recognized. On one hand, a CVV structure is finally unstressable in accordance with the condition which bans non-trimoraic syllables from being finally stressed. On other hand, CVV is finally stressed because it was an inherently trimoraic syllable but it has been reduced from CVVC to CVV. For example, the word /'ʒaːbuː/ *they brought* receives stress on the penultimate syllable; the final one is intrinsically bimoraic while in */ʒaː'buːh/ *they brought it* the final syllable receives stress because it is intrinsically trimoraic. The sound /h/ is historically part of the CVVC final syllable; therefore, it is stressed even after deletion; in fact, it is not deletion because of the trace which reappears in connected speech. In LA, this phenomenon is extended to other sounds such as /ʔ/. So in /buxa'laːʔ/ the final syllable is stressed because it is demoted to being a CVV structure, but preserves its stress assignment since it is an innately trimoraic syllable. These two segments /h, ʔ/ are a part of the consonantal inventory but they are restricted to specific positions in the word. If we consider /ʔ/, it is not preferred word finally or word medially; therefore, the glottal /ʔ/ is avoided in words that are derived from Standard Arabic. For example, words such as /maːʔ/ *water*, /samaːʔ/ *sky* and /faʔir/ *mouse* in SA become /meː/, /smeː/ and /faːr/ respectively in LA. It is just a reduced segment leaving a trace behind and causing a stressed final syllable. Similarly, the /h/ occurs initially and medially but very rarely word-finally. Words such as /saj.ja:rah/ *car* and /ʕima:rah/ building become /sij.ja:.ra/ and /ʕima:ra/. Its place is reoccupied in connected speech, which provides evidence for the trace claim, as is illustrated in /sij.ja:ri**t** ʕaħmid/ *Ahmed's car* and /ʔaɣnija:ʔ-ilmadi:na/ *the riches in the city*. So the re-emergence of /ʕ, h/ whether in the form of themselves or that of other consonants is an indication that they are not completely lost. Thus, the trace of the glottals /h, ʔ/ distinguish between CVV and CVVC structures because a CVV syllable does not attract stress in the final position in LA, while CVVC does. No distinction can be made between CVVC and CVCC structures since both bear stress word-finally.

Al-Jarrah (2011) notices this phenomenon in other Arabic dialects such as Levantine; he is the only researcher to draw a distinction between the trimoraic CVVC and bimoraic CVV in Arabic.

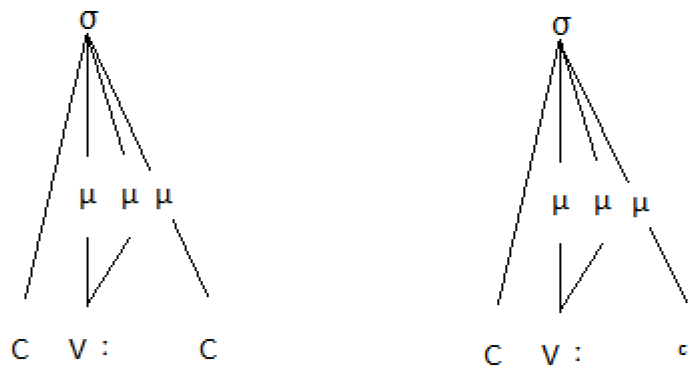
Table 3.10: Glottal Stop and Stress

CVVC	Gloss	CVV$_c$	Gloss
/buxa'la:ʔ/	*tight pl*	/buxa'la:^{ʔ}/	*tight pl*
/ha'na:ʔ/	*proper name*	/ha'na:^{ʔ}/	*proper name*
/ʕuma'la:ʔ/	*clients*	/ʕuma'la:^{ʔ}/	*clients*

Table 3.11: /h/ and Stress

CVV	Gloss	CVV$_c$	Gloss
/'ta:ni:/	*fold/ second*	/ta:'ni:^{h}/	*he folded it*
/'baħda:/	*by/near*	/baħ'da:^{h}	*near him*
/'salla/	*basket/ he entertained*	/sal'la:^{h}/	*he entertained him*
/'ʒa:bu:/	*they brought*	/ʒa:' bu:^{h}/	*they brought it*

Figure 3.23: Trace of glottal Stop and Fricative /h/



Therefore, what makes CVVC and CVCC forms stressable in the final position is the presence of the three moras and what makes the CVV^{c} form stressable in the final position is the trace of the historical consonant. However, what makes the CVC form word-finally stressable in LA?

3.3.5.2 **Final CVC**

Hung (1993) and Steriade (1988) confirm that the CVC syllable is a heavy syllable in Arabic dialects except word-finally, because it is treated as a light syllable as a consequence of one mora reduction which demotes the status of a CVC syllable from heavy to light as if the final C has no weight (Hayes 1995). Rosenthal and Van der Hulst (1999) state that the weight of closed syllables varies based on their environment. This implies that some closed syllables are heavy in certain contexts and light in others. This contradicts Al-Jarrah (2011) who claims that the CVC syllable is grouped with the CVV one as being unstressable word-finally in all Arabic dialects.

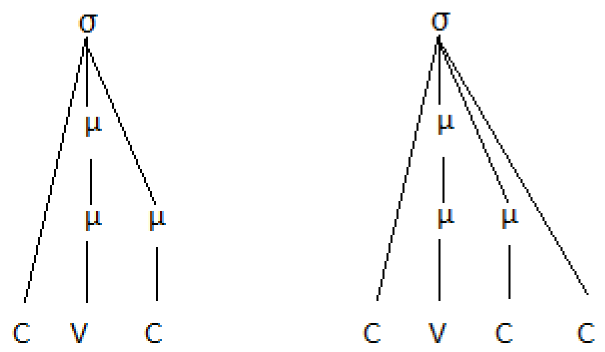
In theory, a certain syllable type is considered to be either heavy or light in all phonological operations. So if the syllable CVC is light word-finally, then it has to be constantly light.

However, in the language of the ‘Tubatulabal’ tribe, closed syllables have two dimensions: they are considered light for the purpose of stress application, but heavy in the reduplication process (Crowhurst (1991) cited in Hayes 1995). This is an indication that the weight of closed syllables in this language has two criteria: heavy in some phonological processes but light in others. Crowhurst (1991) accounts for the twofold measures by adding or removing a mora when required by the rules in the derivation. Does the metrical structure resist this dual representation? In the Cayuga and Yupik languages, for example, the heavy CVC syllable is formed at a late stage which implies that it was light at some stages of the derivation (for instance, the lengthening process is an alternation from a weak status to a strong status (Hayes 1995). It is necessary to account for two distinct weight dimensions in LA. Steriade's (1991) proposal contradicts Hayes' (1995). The former assumes that weight can have only one representation embodied at one mora layer, while the latter claims that weight can be represented at different levels. Hayes (1995, p.300) argues that mora can constitute a grid within the syllable domain; moreover, the number of layers is determined by the sonority of the sound it is attached to. It is considered an unusual case because in the case of lengthening, the mora is added on the same layer, but in the case of the sonority effect, the second mora is added onto a second layer. Therefore, I will appeal to the ’’two layered theory’’ to explain the different weight criteria of CVC syllables in the final position in LA. Before analysing the two-layer structure in LA, it is worth finding out if it has been adopted in other Arabic dialects and why it has been used.

In the Sanʿani dialect of Yemen, Watson (2011) argues that the two-layer representation can account for the avoidance of stressing CVC syllables (in non-final positions) in the presence of CVV and CVG syllables. The closed CVC structure is heavy when the footing is referred to the lower layer and light when the footing is referred to the higher layer, based on the prosodic context. One more advantage is its ability to account for the avoidance of stressing

CVCC syllables in word-final positions in the prosodic environment of CVV and CVG structures. So the final consonant is excluded and what is left (i.e. CVC) is treated as light by referring to the upper layer.

Figure 3.24: Two Layered Mora



Let us consider the case in LA. Table 3.12 below will show three different phonological environments with regard to the word-final CVC syllables.

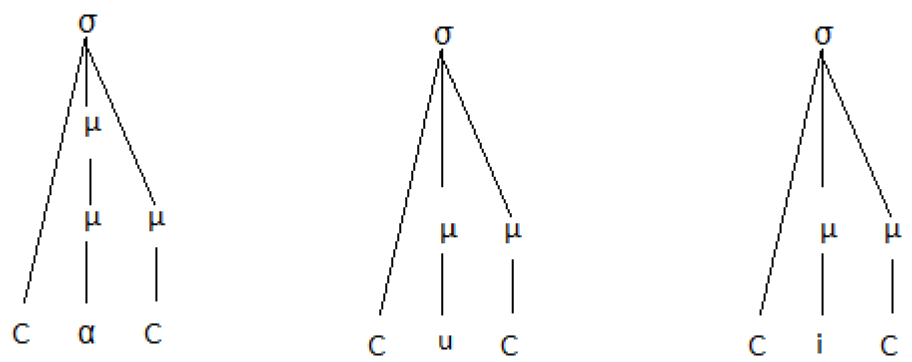
Table 3.12: Final CVC Syllable

CV:.CVC	gloss	**CV**.CVC	Gloss	CV.**CVC**	gloss
/'ma:lik/	*owner*	/'malik/	*King*	/ma'ħɑl/	*shop*
/'ga:dir/	*able*	/'ruʃin/	*Window*	/ʃi'ʒɑr/	*trees*
/'ħa:mil/	*pregnant*	/'himil/	*oriental rugs*	/(ʔ)il'bɑn/	*milk*
/'ħa:dˤur/	*yes/ok*	/'muriʃ/	*Glass*	/(ʔ)ix'mɑr/	*dirt*
/'fa:ris/	*knight*	/'gabur/	*Grave*	/ma'fɑk/	*screwdriver*
/'fa:sid/	*invalid*	/'fagur/	*poverty*	/ma'ħɑd/	*nobody*
/'ba:rid/	*cold*	/'ħakim/	*referee*	/ma'qar/	*place*
/'wa:ʕir/	*tough*	/'ħabil/	*Robe*	/(ʔ)iħ'mɑr/	*becomes red*
/'xa:sir/	*loser*	/'xabur/	*News*	/(ʔ)iʕ'mal/	*problem*

It is the quality of the vowel which differentiates CVC structures. So, a CVC syllable which has a low vowel CaC is more likely to be stressed than structures which contain high CiC and CuC vowels.

The first column in the table displays how the length in the CV: dominates CVC structures. However, if structures do not contain long vowels, then the quality of the vowel is the only dominator in disyllabic words. Looking at the **CV**.CVC and CV.**CVC** structures above**,** the final CVC syllable can receive stress but only under specific conditions. The final syllable is prohibited from being stressed unless it is superheavy (i.e trimoraic), intrinsically trimoraic or if the peak of the final CVC syllable is a low vowel. The dual weight conception assists in forming the trimoraic structure. Therefore, the CαC is not exempt from the stress computation since the height of the column depends on the sonority of the segment it is associated with in Hayes' theory (1995, p. 300). See below for a demonstration.

Figure 3.25: Final CVC



In addition to the traditional weight conditions in LA, it seems that word stress is sensitive to both quantity and quality. So vowel height plays a role in word-final positions when it occurs in an inter-consonantal CαC syllable

The current case falsifies Gordon (2002)’s claim that the difference between low and non-low vowels in receiving stress is inefficient in languages with a vowel contrast. The present case provides evidence to the contrary, because in certain environments and in the absence of vowel length, a low vowel effectively attracts stress.

In fact, stressing the final CαC, which is marked due its position and its structure compared to a CVC syllable in the penultimate position, comes from the notion of sonority. It provides justification for just stressing a CαC syllable, whilst CiC and CuC syllables are avoided. The sonority scale of each segment is determined by the segment's inherent prominence so low vowels are more sonorous than high vowels. The relative sonority is decreased until the least sonorant vowels are reached, as can be seen below.

Sonority Scale:

Low vowel > mid vowels > high vowel

McGarrity (2003), Kenstowicz (1994), de Lacy (2002) and Smith (2002) agree that sonority cannot only determine the peak and the margins of the syllable, but can also determine which nucleus attracts the stress. They explain the relationship between the sonority scale and the foot prominence scale by suggesting that the head of the foot has to be more prominent than the edge. In other words, the part of the foot which is more sonorant than the other is the stressed one. According to Kenstowicz (1994), the more sonorant vowel /a/ is more often selected as the peak of the foot head (stressed syllable) whereas the less sonorant vowel /ə/ is favoured as the peak of the foot margin (unstressed one). Following Kenstowicz (1994), a scale can be derived for the foot head: α < e < i < ə as well as a scale for the foot margin: ə < i < e< α.

Figure 3.26: Position of Vowels in Foot

Foot Head	<	Foot Margins
↓		↓
ɑ < e < i < ə		ə < i < e< ɑ

Based on the above two scales, two criteria can be observed: low vowels are favoured over high ones in the stressed syllable and central vowels are more favoured than peripheral ones.

In the ultimate position, the hypothesis is that the traditional weight assumption (quantity sensitivity) is not the only strategy that can be adopted to account for stress. The quality of the nucleus also impacts upon stress assignment. Quality sensitivity is another aspect in stress assignment which is restricted to some conditions. The common agreement of having three moras in the final syllable in order to be able to attract stress is still satisfied by adopting dual dimensions and preserving the trace of the peripheral segment.

3.3.6 Grammatical Category Affects Stress

McGarrity (2003) observes that languages which rely on sonority to specify the stressed syllable are of two types: either sonority driven stress in which stress is determined by sonority, or stress driven sonority in which sonority is determined by stress position. In the former type, the stress position is determined by the sonority of the nucleus. So stress will land on the most sonorant syllable peak as seen in /ʃi'ʒɑr/. In the latter type, the identity of the nucleus will be converted to a vowel that is higher in the sonority scale to attract stress such as in /'ʔɑzʕil/ versus /ʔiz'ʕɑl/. This means that the language modifies the nucleus to please the metrical structure. It provides evidence that the stressed non-superheavy syllable in a word-final position is disfavoured and consequently marked. The final CVC syllable is forced to receive stress by changing its vowel quality. In a regular pattern, the penultimate CVC syllable is the default position for stress. The vowel lowering process takes place to strengthen the final CɑC.

In order to make a distinction between grammatical categories, vowel identity is changed to provide a valid landing site for the stress. The claim that the penultimate syllable is unmarked is supported in both active/passive forms and past/imperative forms in LA. The active forms of the verbs receive stress on the penultimate syllable, whereas the passive forms of verbs receive stress on the marked position (i.e. the final syllable). In order to obtain the passive forms, two processes take place: shifting stress to the final syllable and changing the vowel identity. Hayes's dual weight criteria can account for these mixed conditioned stress patterns in LA since the final CVC has two weight representations. It is light in the active form and heavy in the passive form because of the sonority level of the nucleus.

Table 3.13: Active and Passive

Active	Gloss	Passive	Gloss
/'nuwlid/	*I give birth*	/nuw'lɑd/	*he was born*
/'niglib/	*I overturn*	/nig'lɑb/	*he/it was overturned*
/'nirsim/	*I draw*	/nir'sam/	*it was drawn*
/'nigtil/	*I kill*	/nig'tɑl/	*he was killed*

Table 3.14: Imperative and Past

Imperative	Gloss	Past	Gloss
/'ʔatˤliʕ/	*go out*	/ʔitˤ'lɑʕ/	*went out*
/'ʔɑzʕil/	*got angry*	/ʔiz 'ʕɑl/	*became angry*
/'ʔɑmsiħ/	*mop*	/ʔim 'sɑħ/	*mopped*
/'ʔɑlbis/	*wear*	/ʔil'bɑs/	*wore*
/'ʔɑnħiʒ/	*succeed*	/ʔin'ʒɑħ/	*succeeded*

If we assume that this dialect is a fully predictable example because it can be accounted for by explaining the vowel alternation, then we ignore the fact that the trigger in this case is not only phonological but also syntactic and lexical. The motivation of vowel lowering is to make the final syllable eligible to receive stress since there are restrictions on stress assignment in the final position in LA. In the mixed conditioned stress, vowel repair occurs in the passive and past forms to attract stress. In the case of cv.CɑC final stress, having an ideal vowel in an ideal environment (a disyllabic CV.CVC) occurs prior to stress allocation.

Grammatical stress: Position of stress → Vowel repair (Vowel lowering)

Final CɑC: Sonorant vowel → Stress position.

3.3.7 Contrastive Stress

In the above examples, the stress assignment is contrasted in two syllables: the penultimate and ultimate syllables; however, it is combined with vowel lowering. By comparing the two words, /'luɾˤa/ *downstairs* and /lu'ɾˤa/ *floor*, it can be observed that no further phonological or non-phonological processes occur in order to assign stress on the ultimate syllable. The only explanation (I have) is that this is clearly a sample of phonemic stress, exactly similar to the contrastive length that differentiates between /ħal/ *answer* and /ħaːl/ *case* and phonemic segments such as /tˤiːn/ *mud* and /tiːn/ *fig*. In addition, it is very important to mention that the number of instances of contrastive stress in LA is limited compared to, for example, Russian stress; but the fact that they exist in the language cannot be neglected. It is surprising that it has not been mentioned before in the literature (as far as I know). Table 3.15 displays such cases.

Table 3.15: Contrastive Stress

Penultimate	Gloss	Ultimate	Gloss
/'lutˤa/	*downstairs*	/lu'tˤa/	*floor*
/'ʔubtˤum/	*do button*	/ʔub'tˤum/	*buttons*
/'walla/	*came back*	/wal'la/	*isn't it?*
/'ʔamal/	*hope*	/ʔa'mal/	*more boring*
/'ʔamar/	*order*	/ʔa'mar/	*bitter*

LA Stress has, to some extent, a mixed stress pattern in which some words are stressed by merely phonological rules and others by an interaction between morphology and phonology; even grammatical influence appears in this stress system along withlexical stress which is seen as a sub-minimum category. This dialect shows partially unpredictable patterns. Basically, any one of the last three syllables may receive stress whether heavy or light. Although this dialect is quantity sensitive, this main requirement is superficially inactive in some cases which makes it difficult to justify why stress is assigned to light syllables unless an in-depth investigation into the underlying form is launched.

3.4 English versus Libyan Arabic Stress Systems

Following the parameters model proposed by Dresher and Kaye (1990), languages stress systems can be described in terms of these metrical principles. The differences and similarities can be captured by determining the type of foot, its sensitivity to weight and the status of the final syllable and so on. However, from Table 3.16 it can be observed that there is almost no difference between the parameter setting in both languages. Despite this, Libyan Arabic-speaking learners of English and English-speaking learners of Arabic make stress-related errors when producing items from the target languages. This is because of two reasons: firstly, the parameters in Table 3.16 can only account for predictable stress patterns with which it will be proven in this study that learners would not encounter problems or difficulties (Chapters 5&7). Secondly, this model is incapable of accounting for learning problems other than differences between the target and the source language. Moreover, other elements like vowel quality and quantity have no room in this parameter model.

Table 3.16: Metrical Parameters and Constraints

Parameters	English	LA	Constraints
P1: The word is strong on the right.	yes	yes	ALIGNRIGHT
P2: Feet are binary	yes	yes	FOOTBINARITY
P3: Feet are built from the right	yes	yes	ALLFEETRIGHT
P4: Feet are strong on the left	yes	yes	TROCHAIC
P5: Feet are quantity-sensitive	yes	yes	WSP
P6: Feet are quantity-sensitive to the rime	yes	R&N[15]	PKPROMINENCE
P8: There is an extrametrical syllable	yes	yes	NON-FINALITY

[15] R&N refers to Rime and Nucleus

Therefore, an OT approach will enable us to solve this mystery, as the main notion of this theory is that all languages share the same universal violable constraints and the difference lies in the ranking of these constraints. The differences in the ranking of the constraints in the production of stress by the native speakers and the learners will be presented in Chapter 5 and 7 in this thesis to determine the areas of difficulty in their interlanguage and I will also show which constraints can conflict and cause production and perception errors.

To conclude, the analysis in this chapter provides the basic facts and generalisations about the stress systems of LA and English. Stress in Libyan Arabic has a default position of on the penultimate syllable; however, some words have stressed syllables in other positions like the final or antepenultimate syllables which means stress falls on any of the last three syllables, depending on their weight. The unpredictability of stress appears in words which have exactly the same segments but different meanings and differ in the position of stress; in words that do not obey the weight conditions; in words that are influenced by the quality of vowels. Some patterns mentioned above in LA stress were selected to test the production and perception of stress of the participants in this study.

4 Chapter Four: Research Methodology

4.1 Introduction

This chapter first specifies and justifies the targeted stress patterns that will be tested in this study (4.2). The second section describes the research questions and hypotheses. The third section presents the pilot study. The fourth section is an explanation of the participants, instruments, materials, stimuli and procedures that the production and perception tests used in this study. The last section presents a key feature of the data analysis: figures from Praat for attested items, demonstrating the position of stress in error items.

4.2 Target Stress Patterns

In this study, we focus our attention on some selected areas of LA stress positioning which emerged as unpredictable or marked patterns in Chapter 2 but we also included some unmarked and predictable patterns for comparison. The first fifteen patterns involve phonological conditioning of stress placement in trisyllabic and disyllabic words and the last three patterns involve a combination of phonological and syntactic conditioning. We refer to these as *stress patterns*. Each stress pattern involves words of one type in terms of the number of syllables, syllable weight and the syllable which is stressed. The word patterns (1 – 18) which we included are described fully in section 4.5.2, and are listed in table 4.5. Some of the attested patterns should not be problematic, however, as they are similar in the two languages and represent predictable stress patterns as is the case in patterns (3), (4), (13), (14) and (15).

In general, target stress patterns were selected for testing in our study based on syllable structure, syllable position and grammatical category. Our analysis shows that the difference between languages alone is not the only predictor and similarity of some sort between English and LA with respect to them, and hence the likelihood of problems arising for English learners producing or perceiving LA.

4.2.1 Phonological Patterns

The first target stress pattern in this study is that of a final syllable with different syllable weights, superheavy, heavy and light, and how this relates to stress position in LA. These final syllables occur in words with different numbers of syllables and both verbs and nouns (we are especially interested in word patterns (9), (10), (11), (12) and (17) in table 4.5). A second focus is on word final syllables with different vowel qualities, high and low vowels, and how that affects stress position (word patterns (16), (18), (11), (12)). A third focus is on stressing the light syllable in the presence of the heavy one (word patterns (5) and (6)). The rest of the patterns should not cause a problem for the learners.

We now explain the differences between English and LA with respect to these stress patterns. In the previous chapter, we discussed the stress systems of the two languages. We have noticed that the two systems exhibit similar stress parameters, but that the difference might lie in the priority of applying these parameters or in the ranking of the constraints from an OT point of view. That is what is at work in the discussion in Chapters (5) and (7).

English and LA possess to some extent similar phonological systems; it was noted that if only binarity with a trochaic foot type is applied from right to left in trisyllabic words composed of light CV syllables (word pattern (1) in Table 4.5: CVCVCV), the antepenultimate syllable would not be able to receive stress, though in fact it can in both English (*'policy*) and LA (*'ʃarika*). Therefore, another condition has to be involved to enable the correct forms to be generated/selected: extrametricality/ NON-FINALITY. If the last syllable is excluded, it is then possible for stress to reach the antepenultimate one (cf Chapter 2). The question is then what type of final syllable is allowed to be excluded? For English and LA, this is given in Table 4.1 through extensions to the requirement of the extrametricality condition. Therefore, we will notice in the discussion chapter that NONFINALITY is parameterised to cover the criteria in table (4.1). English and LA agree on exempting the final syllable on the right but they do not agree about the type and structure of the excluded syllable (Table 4.1).

Table 4.1: The Conditions of Extrametricality in English and LA

Extrametricality	English	LA
The final syllable is excluded from the right.	Yes	Yes
Extrametricality is restricted to a certain grammatical category	Yes	No
Weight of syllable (superheavy) blocks extrametricality	No/Yes	Yes
Vowel quality (low) blocks extrametricality in a specific phonological environment.	No	Yes

It can be noticed that the conditions modify the application of extrametricality, which means that they are possibly the triggers for miss-performance since the main requirement of extrametricality do not indicate any area of differences. If the final syllable is superheavy (word patterns (9), (10), (17) in Table 4.5) it is stressed in LA regardless of the weight of the other syllables and of the grammatical category of the word, but in English this superheavy final syllable can be avoided as a stress-receiving site (e.g. *'marmalade* and *'analyse*). Furthermore, where the final syllable contains a low vowel (under a specific phonological environment as explained in Chapter 2), it attracts stress (word patterns (12) cf. with (11) and word patterns (16) and (18)).

Our third target stress pattern is the status of the light antepenultimate syllable as a stress bearer in the presence of a heavy penultimate one in trisyllabic words (word patterns 5 and 6) However, patterns 4 and 7 are not supposed to be problematic as the heavy penultimate syllable attracts stress. Although both languages are weight sensitive, the target language has a marked stress pattern which requires stress to skip from the heavy penultimate to the light antepenultimate syllable. In fact, a similar structure is also available in English as in *'register*. This occurs in LA, because as explained in Chapter 2, epenthetic vowels do not receive stress (Ito 1986). Table 4.2 shows that the quantity sensitivity requirement alone is insufficient to capture this pattern. Therefore, the WSP constraint is also parameterised in the discussion chapter and its relative ranking may assist in explaining learners' performance. Moreover, this stress pattern presents more than one reason why learners might wrongly stress the heavy penultimate syllable; either because they are reverting to a universal parameter/constraint that heavy syllables are generally stressed, which was referred to in Chapter 2, or maybe because they do not derive forms like /'madirsa/ *school* in their grammars by insertion but rather regard the vowel as a full (genuine) vowel, part of the deep form. In English, cases like *ve'randa* are more dominant than the ones like *'seventy* or *'register* because they follow the regular phonological patterns (as mentioned in Chapter 2). This means that learners possibly restore the unmarked/ predictable setting despite their L1 unpredictable patterns (Mazurkewich 1984). Archibald (1993) claim that the L2 learners turn back to the unmarked L1 but not necessarily to the default patterns. However, it is difficult to find a clear cut answer because both the unmarked pattern and the default pattern in the L1 converge in that they favour a heavy penultimate CVC as the stressed one. The extended requirements of quantity sensitivity in Table 4.2 captures the difference between an epenthetic vowel and a genuine one.

Table 4.2 Conditions of Quantity Sensitivity

Quantity Sensitivity	English	LA
Feet are quantity-sensitive	Yes	Yes
Feet are QS to the nucleus/rime	Rime	Rime/Nucleus
Feet are QS to the epenthetic nucleus (so inserted vowel does not accept stress)	Not applicable	No

Thus the areas of difficulty can be recognized by comparing similarities and differences between both languages. This can only be achieved by digging deeper into the requirement of some constraints such as the WSP and NON-FINALITY and parametrising their requirement.

4.2.2 Mixed Conditioned Stress Patterns

We also chose to target three stress patterns which involve the conditioning of stress placement other than by phonological conditions alone (patterns (16), (17), (18) in Table 4.5). English and LA contain non-pure phonological patterns such as minimal pairs which are different in stress position dependent on their grammatical category in English (*'import* and *im'port*) and pairs which are different in stress dependent on their individual vowel identity and their grammatical category in LA. The differences and similarities are presented in Table 4.3 below.

Table 4.3: Non-pure Phonologically Conditioned Stress

Stress	English	LA
1- Noun/ Verb Oppositions	Yes	No
2- Past/ Imperative Oppositions	No	Yes
3-Active/ Passive Oppositions	No	Yes

Pattern 17 is not considered to be problematic as it exhibits a straightforward pattern. Stress will be assigned on the penultimate syllable in the 3rd person past form CVC.cvc and on the ultimate syllable in the 1st person past form cvc.CVCC. The latter attracts stress to the final syllable because it is a superheavy one CVCC.

Because of the infrequency of stress being used in LA to mark noun/verb distinctions and lack of this distinction in other Arabic dialects (1), it has been proven by various studies (Zuraiq 2005, Jleiyal 2004, Aziz 1981, Anani 1989, Suleiman 1993 and others**)** that this type of stress irregularity causes a problem for Arabic speaking learners of English. However, no difficulty would be predicted for learners in the reverse direction, hence the current study is not concerned with (1) in Table 4.3 above.

The past and imperative patterns (word patterns (18) in Table 4.5) and the active and passive patterns (word pattern 16) are phonological with a partially grammatical interface. They were chosen for our study because such oppositions are unknown in English. Hence they might be a source of problems in the learner IL.

Since the non-superheavy final stressed syllable is less frequent in LA (patterns 16b, 18b), words that have this type of pattern will be considered as the marked form compared with its oppositions, whereas words with non-superheavy final syllables and penultimate stress are the basis of the main structure from which the infrequent category is derived (16 a, 18a). Hence, the passive form is obtained from the active form and the past is derived from the imperative form. Phonological influence occurs when the vowel identity of the stressed syllable changes to a low vowel in order to attract stress as explained in Chapter three. Thus, there is a morphological change from the forms in (16a), (17a) and (18a) to those in (16b), (17b) and (18b), marking a difference of grammatical meaning (inflection). However, a consequence of that, due to the phonological shape of the grammatical morpheme, is that the stress also moves in pattern (16) because the morpheme involves a change of the peak of the final syllable to a low vowel; in pattern (17) because it creates a superheavy final syllable and in pattern (18) again because it involves a low vowel.

The implication for our study here is twofold (if the learners did not get theses patterns right): learners might assign the stress correctly on the penultimate syllable as presumably stressing the penultimate syllable is universally less marked and exclude the final syllable in both subcategories, or they might stress the final syllable in both subcategories based on the fact that these words are verbs. This is an L1 transfer prediction because in English verbs sometimes are marked by final stress (*im'port vs 'import*).

4.3 Hypotheses and Research Questions

It has been shown that English and LA contrast in the underlying forms of some stress patterns. For example, comparing the surface forms of /'makinsa/ *hoover* in LA with '*calendar* /'kælındə / in English, It can be noticed that both are similar /CV.cvc.cv/ with stress on the light antepenultimate but the underlying forms are different though. This pattern is considered a marked one as it does not follow the predictable patterns. So it is similar in the surface but different in the underlying structure.

Three areas of stress patterns have phonologically conditioned stress positioning: the non-prominence of the epenthetic vowel in a heavy penultimate syllable and the prominence of the superheavy final syllable and the low vowel effect. Differential position of stress in the active/passive, 3rd/1st person past and imperative/past has a syntactic-phonological analysis.

The choices the learners have, as described in chapter 2, are to produce or perceive LA using transfer from their L1, or to apply what they have learnt from L2 input, or adopt patterns that are not part of either the L1 or the L2, which might be a result of universal (markedness) or developmental effects. Following the literature, the analysis of interlanguage stress most likely emerges from differences between the L1 and L2 (i.e. transfer). This statement is confirmed by several studies that investigated L2 stress such as Aziz (1981), Anani (1989), Maris (1989), Suleiman (1993), Archibald (1993), Youssef and Mazurkewich (1998), Jleiyal (2004) and Kijak (2009).

In Kijak's version, the Differential Hypothesis (2009, p221) mentioned below can only account for the differences when an element exists in both languages but differs in its application. For example, in the current study, extrametricality is applied in both languages but the restrictions on its application are different.

(H1) The Differential Hypothesis

''The bigger the differences between the phonological properties of L1 and L2, the lower the success rate in the L2 stress''.

However, when the element does not exist in L1 (as in the active/passive opposition or the stressless epenthetic vowel) it means that the learners do not have an option to choose from. The Differential Hypothesis cannot account for the learners' performance when neither L1 nor L2 stress patterns are applied. However, if learners then assign stress in the default position in languages, then this would support Kijak's (2009, p.225) second hypothesis.

(H2) The Default Values Hypothesis

'' Some learners in their L2 acquisition of stress

revert the values of the metrical parameters to default and

they acquire the L2 values following the learning path specified

for L1 acquisition of word stress''.

The first essentially predicts access to and transfer from L1 with the usual simple CAH 'difference - difficulty' idea. The second appears to predict access to and use of UG (especially markedness) as in L1 acquisition. This is similar to what has been discussed in Chapter 1 and 2. If learners, surprisingly, do not apply L1 transfer or knowledge of L2, but adopt only some patterns of their L1 or L2, and/or choose a non-default (i.e. marked) position, this would mean that factors other than the L2, L1 or default position have an impact on their performance. Another hypothesis would have to be formulated in order to account for all the IL data and not leave any pattern out.

The Differential Hypothesis and *The Default Values Hypothesis* (Kijak 2009) may provide an explanation for a good deal of the IL performance of our learners. However, we are prepared for the eventuality that these two hypotheses might not account for all the IL patterns observed. Hence we propose our own.

Based on our account (currently in 4.2) of the stress patterns that we are targeting in our study, we can relate the key features of these to potential L1 transfer (H1) as follows.

- *Extrametricality* is available in both languages, though the languages differ with respect to the application of this condition.

- *An epenthetic vowel* does not affect the potential stress bearer in English, while it does in LA.
- *Vowel quality* affects stress in both English and Arabic but the effect is based on different aspects of vowels. Vowel quality in terms of height might affect stress in LA but vowel reduction in English might affect stress position when surely it is more phonetically natural to see the stress as leading to the vowel reduction.
- *Imperative/past pairs* do not exist in English differing in stress position; therefore, there is no clear evidence for the L1's role.
- *Active/passive pairs* do not exist in English differing in stress position; therefore, there is no clear evidence for the L1's role.

Thus we see that some of the stress patterns we target do have equivalent features in both languages but are applied to stress differently in detail (extrametricality, epenthetic vowels and vowel height): these I term unpredictable. Some have non-equivalent features (the three partially grammatical/syntactically conditioned stress patterns) and others have fully equivalent patterns. I propose Hypothesis 3:

(H3-1) if the stress patterns match in the L1 and L2, they are unmarked and they follow regular phonological conditions, the prediction is that learners should get these patterns right by just applying the predictable/unmarked patterns.

(H3-2) If the stress patterns are similar but applied differently and they are considered marked as they contradict predictable patterns[16], the prediction is that these unpredictable patterns are not accessible in the L2 despite their partial availability in L1.

[16] They are marked (meaning not following universals) and not having regular phonological conditioning in L2 and L1 (marked within the language).

(H3-3) If the stress patterns do not exist in L1, then the L1 negative transfer effect may appear in the L2.

Recalling the research questions from the general introduction, repeated below, the focus is to examine how the learners will produce and perceive the selected patterns, to test whether the learners will have access to the predictable patterns (i.e. unmarked and predictable by phonological conditions) as well as the unpredictable ones (i.e. marked because they are not governed by the phonological conditions alone or they are governed by complex phonological conditions) and to find out the extent to which their L1 will affect their performance. A comparison between the native speakers and the learners will be adopted to answer the questions and test the hypothesis mentioned above (H3).

- Which target stress patterns are the learners accurate on and which target stress patterns are they inaccurate on in production and perception?
- What phonological constraints govern the production of stress patterns of English-speaking learners of Arabic and of the native speakers?
- What phonological constraints govern the perception of stress patterns of English-speaking Learners of Arabic and of the native speakers?

4.4 The Pilot Study

A pilot study was conducted to check the instruments that will be used in the main study and improve them if necessary and to check some of the useable data with two different groups of participants. Libyan participants were used in order to derive the Libyan stress system and to compare their performance with the learners. According to Guion (2004), one of the drawbacks of previous L2 stress studies is that phonological rules which are available in the literature about the target language will not always work with the native speakers themselves; in other words, some control groups show slightly different patterns from the theoretical patterns. Therefore, data from Libyan speakers was collected too. Five English-speaking participants and five Arabic speaking participants took part in the pilot study. The instruments used were all four aspects that were planned to be used in the main study: a background questionnaire, a basic vocabulary knowledge test, and tests of production and perception knowledge of word stress.

A questionnaire was used to obtain information about the participants' linguistic background; for example, Libyan subjects who showed knowledge of other languages in addition to their mother tongue were excluded from the study in order to get pure monolingual NS stress patterns. Two forms of this questionnaire were used, one written in Modern Standard Arabic for the LA native speakers and one written in English because the English-speaking group could only communicate orally in Libyan Arabic and only oral performance was targeted in our study.

It was not possible to test the knowledge of LA by the English-speaking participants using a written test for the reasons I have mentioned above. Therefore, I created an audio-recording test. It is designed to check if the participants had similar knowledge and to select the words for the tests of stress production and perception. The learners were required to take a multiple-choice vocabulary test of the target words[17] (see Appendix 3) to evaluate their knowledge of the items and ensure that their basic vocabulary knowledge would not affect their stress production or perception. They were asked to

[17] 1- Problematic and unproblematic target words were included and the exact form of the word was tested.

listen to the questions with three options and choose the right answer. If the participants got the answer right, then this was taken to show their receptive knowledge of the particular item.

Sample:

Open the……………, please! (Floor, Sand, Window).

/'ʔaf.taħ il-…………..., min 'fadˤlik! (lu'tˤa, 'gaz.za, 'ruʃin)/

Only items recognised by all the participants in this test were included in the stress production and perception tests. This method is used to determine participant knowledge of the items in the main study following Archibald (1993).

The word tokens used in the vocabulary knowledge test and selected for the tests of production and perception knowledge of stress were chosen to test the following factors: (1) different stress positions, (2) different syllable structures (number, weight and vowel height of syllables), and (3) near minimal pairs with regard to stress position, differing in grammatical categories. Around 4 items were selected for each of (18) word patterns (Table 4.5) which in turn were required to cover the targeted potentially problematic stress pattern areas we described in section 4.2, together with some non-problematic ones. Some of the word patterns were designed to examine the stress position regardless of the influence of syllable weight. In order to know which position was the most preferred bearer of stress, some of the items were created with equal syllable weight such as in patterns (1), (2), (13) and (14). Thus some items only contain open syllables (CV) and other items only contain closed syllables (CVC) so any effect of syllable weight which attracts stress can be controlled (for a fuller explanation see 4.5.2).

To examine the perception side of L2 stress, an identification test was constructed using the selected word tokens. In this, native speakers and learners were asked to specify the position of stress by marking the stressed syllables on a sheet of paper. English speaking participants were asked to listen to a native speaker and decide which syllable is the most prominent one in the word. To examine production, using the same set of specific word tokens, English speaking participants were asked to undertake a picture naming task, i.e. to name the object in the picture or the action displayed. Each item was displayed individually on one PowerPoint slide (a full description of these instruments is given in 4.5)

4.4.1 The Findings of the Pilot Study

The pilot demonstrated that useful data could be gathered by these means. In the production test, the learners paid much attention to the syllable weight. A general preference was shown towards the penultimate syllable position, and the antepenultimate one if it existed. Although English contains minimal pairs which differ only in stress position and grammatical category, the learners missed this distinction when it comes to L2 stress patterns. The main conclusion that can be made about perception is that the native speakers found it difficult to perceive the stress position in their L1.

With respect to improving the instruments for the main study we found that the materials used and the procedures followed by the native speakers and the learners were not sufficiently unified. The native speakers should take the same tests and follow the same procedures in the main study so as to guarantee the validity of the results. Furthermore, the participants were asked if there was anything problematic about any of the tests or procedures: in the production test with learners, since orthography was absent from the slides, the learners sometimes spoke a synonymous item instead of the target item which we aimed to elicit. Therefore, to help us obtain the responses we need, in the main study a translation in English will accompany the picture. The vocabulary test was not sufficient to test the proficiency of the learners; therefore, another method of evaluation was adopted to assess the proficiency level of the learners in the main study. No revisions were made to the questionnaire but some revisions were made to basic vocabulary test.

4.5 The Main Study

4.5.1 The Participants

4.5.1.1 **Learners of LA**

The status of the participants is exceptional for two reasons: they are L2 adult learners and they acquired the language without L2 classroom instruction. It can be said that they needed to acquire a language that is not familiar to them in order to be able to communicate with the community. Therefore, we would expect that a variety of methods of learning Libyan Arabic were adopted by the learners. They learned the language naturalistically through their husbands, their children who were raised there, the family of their husbands and local friends as reported by the learners in the questionnaires. They are only able to communicate orally in Libyan Arabic and the written form is absent, apart from a very limited knowledge of the orthographic representations of some random words by some participants. They are a group of fifteen female subjects whose mother tongue is British English who had moved to Libya due to their marriage to Libyans; the participants ranged in age from 36-52 at the time of the study. They had settled in Tripoli and some of them became English teachers.

They also reported that they became confident in conversation after an average of three years of residence. Therefore, the participants were chosen based on the length of their residence in Libya which had to be no less than three years to guarantee that the learners had been sufficiently exposed to the language. They had been resident in Libya for between 3 and 20 years. Different researchers suggest different scales for fluency in L2 starting from 1 year. Best and Taylor (2007) suggest a minimum of a year; Guion et al. (2000) suggest a minimum of 3 years and Fledge (1993) suggests a minimum of 5 years. The selection of the participants was also based on availability (convenience sampling) and the snowball method[18]. Therefore, the number of the participants (15) is limited and it was very difficult to find participants willing to participate and who met all the criteria. However, as the current study is the only study (as far as I know) which addresses the L2 stress patterns of English learners of Libyan Arabic, this limitation can be overlooked and this study can be analysed in terms of the number of items rather than the number of participants. Some of the participants reported that they have a very limited knowledge of other European languages such as French, Spanish or German. All of them obtained a GCSE level education and 9 had undergraduate degrees (but not in Linguistics). According to their statements, they listen to and speak LA on daily basis and some of them had travelled to other Arabic speaking countries for short trips only and they did not use any teach yourself resources at home.

The aim of this study is not to investigate the difference between classroom and natural learning processes or to examine the individual learning methods used by participants. However, a statement about the circumstances of the participants is given in the section below.

[18] Friends of friends are invited to participate in the study if they met the criteria.

4.5.1.2 **The Linguistic Context of the Learners**

The learning environment affects language acquisition, whether it is a classroom environment or in a naturalistic environment (instruction versus immersion). Gass (2013) found, by comparing two groups of learners acquiring the language in two different settings, that the group acquiring the language with no instruction made fast progress but with less accuracy, whereas the group who acquired the language with instruction made less progress but showed more knowledge of the language that led in turn to more accurate performance. Ellis (1989) found that learners in naturalistic settings are less successful and classroom learners show rapid progress which contradicts Gass' findings.

Also, the type of input that the naturalistic learners receive affects the acquisition process in a positive way since their input will be from native speakers themselves but it can also be incomprehensible initially; however, in a naturalistic environment learners receive little feedback or error correction and no explicit linguistic instruction. Therefore, the focus will be on conveying the meaning more than on accurate pronunciation or accurate grammar (Pica, 1983).

It seems that some researchers agree that instructed acquisition results in more accurate performance than naturalistic acquisition. One might suggest that despite the complexity of the stress system of the learners' L1 in this study (i.e. the complexity of their linguistic background), the learners may still make errors, whether due to the lack of instruction or the effect of the L2 regardless of the learning environment or the type of their L1.

According to Krashen's theory (1981) of second language acquisition, young learners who lived abroad can gain near-native fluency but their knowledge about the language is limited – they have accurate pronunciation with no awareness of phonology. This is most likely achievable by young learners but not adults. Therefore, the factors of age and the length of exposure would have an influence on the process of acquisition and the ability to acquire a native-like fluency by adult learners is more complicated in naturalistic environments as acquisition might not occur unconsciously as normally happens with children. Children *acquire* language, adopting an 'implicit learning mechanism' but adults follow a conscious strategy of *learning* that is accompanied by other factors such as motivation and anxiety. Therefore, adult learners might perform better in an instructed learning environment while children perform better in a naturalistic environment and this is proven as children always exceed the performance of adults in learning a language when moving to a foreign country (Jaspal, 2009).

There is a claim that adult L2 learners face difficulty in the area of pronunciation compared to children so it is especially difficult for them to obtain native-like pronunciation. However, Knudsen's finding (2004) contradicts this claim as some adult learners reached native-like pronunciation and were able to attain native-like proficiency in the language despite having passed the ''critical period'' of acquisition. He justifies this by arguing that acquiring the language is not restricted to a critical period but rather that there is a "sensitive period" when the learners can use different acquisition abilities based on the learners' cognitive and personal factors. This might apply to the learners in the current study who have acquired the language in a naturalistic environment starting after the critical period, and have lived in the host country for at least three years.

This study has no interest in examining the effect of the naturalistic environment, age or any other factors that might influence the performance of the learners - the focus of this study is rather to provide a theoretically based phonological analysis using Optimality Theory in order to investigate the learners' grammar with regard to stress assignment in production and perception of stress. In other words, the focus is on the linguistic factors that affect stress assignment by learners following Guion *et. al.*'s work (2003, 2004, 2005, and 2006).

4.5.1.3 **Proficiency of the Learners**

Given that the learners had received no formal instruction, it was difficult to determine their level of proficiency and to provide a systematic evaluation. However, in the main study, conversational test was used to assess the oral proficiency of the participants. For this, before the other tests, a short conversation took place with each individual participant composed of five questions. The test was around 15-20 minutes long. The first two questions are about the participants' themselves and their family (introduction part). The third question is about a particular topic and the participants were given an opportunity for an individual turn. The last two questions are a two-way conversation between the participant and the researcher and they are linked to the topic introduced in the third question. A mark is given to each criteria achieved in the oral test: pronunciation, accuracy, coherence, lexical resources and grammatical range. A full description of the criteria is given in appendix 2.

The multiple choice verbal vocabulary test was also used as in the Pilot to determine knowledge of the items to be used on the production and perception tests[19]. The items were revised in the production and perception tests and only items known by all participants were included.

There was a wide range of proficiency and vocabulary knowledge among the participants, possibly due to the different lengths of time spent in Libya, also reflected by their age, and correlates strongly with the conversation tests (r=.62), less well with the

[19] See appendix 3 for the multiple choice vocabulary test.

vocabulary knowledge test (r=.33). The participants were at rather different stages in acquisition but in the analysis I treated them all as one group; this was not ideal but was unavoidable as well. Therefore, there was a need to narrow the discussion and to refer to individual performance in some occasions in Chapter 6.

Table 4.4: Oral Proficiency and Vocabulary knowledge of Participants

Participants	Age	Conversation out of 5	Vocabulary Test out of 105	Unrecognised words
1	38	2	76	29
2	43	4	96	9
3	40	3	78	27
4	42	3	76	29
5	52	4	87	18
6	39	5	100	5
7	50	5	103	2
8	48	5	77	28
9	36	3	76	29
10	44	3	79	26
11	52	5	89	16
12	42	3	87	18
13	42	4	94	11
14	39	2	77	28
15	46	3	81	24

4.5.1.4 **The Native Speakers**

The native speaker group was composed of 15 female native speakers of Libyan Arabic ranging in age from 20 to 64. All the participants had obtained GCSEs (or equivalent), 7 participants have undergraduate degrees and 4 participants have MA degrees. According to their statement, they have no knowledge of foreign languages apart from some random English words and basic phrases in English. The role of this group was to confirm the researcher's judgment of what the native speaker stress patterns were which the learners would have heard as input, and to validate the scoring for accuracy (RQ1). The accuracy was judged based on the native speakers’ responses and Praat software shows which syllable is the stressed one by the native speakers and the learners. They also were used to validate the responses to the picture naming task, and generally to compare with the learners' performance.

4.5.2 Word Patterns and Word Stimuli Used in Production and Perception Tests

4.5.2.1 **The Word Patterns**

Following Louriz (2004) and Guion *et.al.* (2003,2004, 2005, 2006), the test material was designed on the basis of the similarities and the differences between the phonological stress patterns and the partly syntactic stress patterns found in the L1 and L2 which we discussed in 4.2 and Chapter 3. The word tokens are 76 disyllabic and trisyllabic LA words falling into (18) different word patterns chosen to allow us to elicit information on the targeted stress patterns which we regard as likely to be problematic for learners, and others that we do not expect to be problematic (see again 4.2 and 4.3 for the correspondence between targeted stress patterns and word patterns).

In selecting the word patterns (Table 4.5) and specific words to test, the following criteria were also used. We wished to include word patterns which enabled us to test learner accuracy in stress positioning (on antepenultimate, penultimate, or ultimate syllables) where syllable weight did not play a part and therefore was controlled. This required words with word patterns that contained either all light CV syllables or all heavy CVC syllables. In trisyllabic words, that is word patterns (1) and (2), and for disyllabic words (13) and (14). Words which contains only superheavy syllables such as *CVVC.CVVC.CVVC, *CVCC.CVCC.CVCC and *CV:.CV:.CV: do not exist in

Libyan word structure. Therefore, the CV.CV.CV (1) and CVC.CVC.CVC (2) patterns are used primarily to test learner knowledge of how syllable position affects stress.

We also wished to include word patterns which enabled us to test learner accuracy in stress positioning where syllable weight is the key factor. In order to test syllable weight, Guion's method (2004) was adopted, and word patterns with varied syllable weights were used as in patterns (3), (4), (5), (6), (7), (8), (11), (12), and (15). Each syllable position had the possibility of being either light or heavy except the superheavy syllable which can only occupy the ultimate position as in patterns (9) and (10). Thus in three syllable words there are potentially six word patterns with mixtures of CV and CVC syllables. Of these three are common: CVC.CVC.CV (word pattern (3)), CV.CVC.CVC (4) and (6), CV.CVC.CV (5). Of the remainder the CVC.CV.CV /muʃkila/ *problem* pattern causes a problem since the native speakers themselves tend to shorten it to CVC.CCV by deleting the vowel and forming a cluster, so we omitted it. The structure CVC.CV.CVC does not exist in LA: the nearest word pattern has a long vowel in the penultimate syllable e.g. /zaʕmaːtik/ *pretend* which makes it very similar to CVC.CVC.CVC since both CVC and CV: are heavy so it is excluded from this study. The structure CV.CV.CVC is also excluded because the structure is available in Standard Arabic but rarely occurs in LA, e.g. /matalan/ *for instance* and other words considered to be very formal and rarely used in everyday life. Both the mixed disyllabic word patterns occur in LA so are also used: CV.CVC (11), (12), and CVC.CV (15) as mentioned above.

4.5.2.2 The Specific Items (word tokens)

The stimulus word set is composed of 76 words, falling into the (18) word patterns (Table 4.5). The stimuli used in the production task were exactly the same stimuli used in the perception task. The words used are highly frequent real words of LA (Yoda 2005; Al-Suhby 1992)[20]. Non words are not used in this study due to the learning circumstances mentioned earlier in this chapter. When using real words, it is sometimes difficult to tell if learners' responses reflect stress learnt word by word (what I would call lexically) and stored in mental lexicon, rather than leamed by rule/constraints and not stored on a word by word basis. Only items that were recognised by the learners in the multiple choice basic vocabulary knowledge test were included: the items that were not recognised by the learners were excluded at the beginning from the study. This decreased the number of items from 105 to 76 and meant that the patterns have an unequal number of tokens ranging between 3-5 in each pattern and sub pattern.

Words in patterns (1-15) are mainly nouns with a very limited number of adjectives. Patterns (16-18) are all verbs and include subcategories that differ in their stress position. Due to the nature of the phonology and morphology of LA, it was difficult to make a distinction between morphological and phonological forms and only include uninflected forms. Therefore, some of the items used are morphologically inflected.

The production and perception stimuli are:

CV.cv.cv Pattern (1): /'ʃarika/ *company*, /'samaka/ *fish,* /'mariga/ *bib*

cvc.CVC.cvc Pattern (2): /mid'zawwiʒ/ *married*, /mid'bahdil/ *messy*, /mis'tawsˤif/ *clinic*, /mit 'ʕaflig/ *angry*, /mus'taqbil/ *future.*

cvc.CVC.cv Pattern (3): /mus'taʃfa/ *hospital*, /mux'tilfa/ *different*, /mix'timra/ *wearing veil*

[20] Al-Suhby (1992) recorded spontaneous conversations on daily basis for 5 participants from different social classes and also recorded the local morning radio programme for 6 months in a sociolinguistic study.

cv.CVC.cvc Pattern (4): /mu'handis/ *engineer*, /ʕa'bamber/, *almond biscuit,* /mu'darris/ *teacher*

CV.cvc.cv Pattern (5): /'mazirʕa/ *farm,* /'madirsa/ *school,* /'makinsa/ *hoover,* /'makitba/ *library,* /'basimta/ *his smile*

CV.cvc.cvc Pattern (6): /'kabiʃkum/ *your ram,* /'malikhum/ *their king,* /'gabilhum/ *before them*

cv.CV:.cv Pattern (7): /ru'za:tˤa/ *almond syrup,* /ʃi'ba:ni/ *old man,* /ʕi'ma:ra/ *building*

Cvc.CV:.cv Pattern (8): /sfan'na:ri/ *carrot,* /dar'bu:ka/ *drum,* /ʃig'ga:ga/ *money pot,* /gar'ʒu:ma/ *throat,* /xan'fu:sa/ *beetle*

cvc.cv.CV:C Pattern (9): /bukiʃ'ʃa:ʃ/ *lizard,* /manda'li:n/ *clementine,* /firħa'ni:n/ *happy pl*

cv.CV:C Pattern (10): /fla'li:s/ *chicks,* /ki'sa:n/ *wine glasses,* /ɣ̞a'fi:r/ *building quard*

CV.cic Pattern (11): /'muriʃ/ *glass,* /'ruʃin/ *window*, /'ħabil/ *rope*

cv.CaC Pattern (12): /ma'ħal/ *shop,* /ʃi'jar/ *trees,* /ma'mar/ *corridor*

CV.cv Pattern (13): /'ɣaba/ woods, /'lutˤa/ *downstairs,* /'tˤawa/ *pan*, /'sˤala/, *living room*

CVC.cvc Pattern (14): /'filfil/ *pepper*, /'maktib/ *office*, /'maxzin/ *storage room,* /'mafriʃ/ *table cover*

CVC.cv Pattern (15): /'ʃibka/ *net,* /'ʃarba/ *soup*, /'ħufra/ *hole*, /'bugra/ *cow*

CVC.cvc/cvc.CVC Pattern (16): *active/ passive* /'niglib, nig'lab/ *overturn*; /'nuwlid, nuw'lad/ *give birth*; /'niktib, nik'tab/; *write* /'nirsim, nir'sam/ *draw*

CVC.cvc/cvc.CVCC Pattern (17): *3rd person masculine past /1st person past* /'baddel, bad'dilt/ *change;* /'fakkir, fak'kirt/; *think* /'kassir, kas'sirt/ *break*

CVC.cvc/cvc.CVC Pattern (18): *Imperative/ 3rd person past* /'(ʔ)albis, (ʔ)il'bas/ *wear*; /'(ʔ)azʕil, (ʔ)iz'ʕal/ *anger*; '(ʔ)aftiħ, ʔif'taħ/ *open;* /'(ʔ)amsaħ/-/(ʔ)im'saħ/ mop

In the production and perception tests, they were not presented in groups pattern by pattern, but items are mixed in the three major groups of trisyllabic words, disyllabic words and disyllabic verbs. The items of the mixed conditioned patterns were presented in pairs.

4.5.3 Production and Perception Tests

The study had two phases: production and perception tests. The production test was a picture naming task. In studies testing the production of items in children's[21] phonological development, the picture naming task has proven to be the ideal method of investigation of phonological production without the use of orthographic representation (Ohala 2008). The perception test was an identification test that is considered effective and reliable in testing the perception of stress by learners (Archibald 1993; Boersma and Hamann 2009, Altmann 2006; Kijak 2009). The production test took place prior to the perception test to avoid the chance of participants remembering the position of stress in words they heard when they later had to produce the same items in the production task (Kijak 2009). The materials used for each test are further described along with the procedure in the next section.

[21] The learners in the current study and children are not able to read or write.

4.5.4 Procedure

The study took place between August 2012 and April 2013 in the UK and Libya. Ethical approval was obtained from the University of Essex for this study before the data gathering commenced. After agreeing to participate, the participants gave formal written permission on a consent form and an explanation of the study was provided without mentioning that the target was to look at the prominent parts of words. They were informed that the focus was on knowledge of Arabic words in general to draw their attention away from pronunciation.

The data was gathered separately from each participant by the researcher in a quiet place at various locations convenient to the participants. The participants received no payment and participated voluntarily. Three meetings were arranged for each participant: in the first meeting, the participants were asked to fill in the consent form and the questionnaire and (learners only) to take the oral multiple-choice vocabulary test and to answer the five questions in an oral proficiency conversational session. In the second meeting, participants were asked to undertake the production / picture naming task. In the third meeting, participants were asked to undertake the perception / identification task. The production and perception tests were usually around 90-120 minutes long including breaks, but there was no time limit and the participants decided when to move to the next slide.

The questionnaire (appendix.1) was used to gather information about participants' linguistic backgrounds which might be helpful in the analysis of their production and perception of stress. After examining the responses to the questionnaire, the researcher excluded one participant due to her short residence in Libya and the limitations of her vocabulary knowledge; she was omitted from the beginning of the data analysis.

Extreme care was taken to explain the procedures of the production and perception tests. Individual instruction was given at the time of each task. Nine practice items were used before the real tests to familiarise the participants with the procedures, namely /mak'ruːna/ *pasta,* /'kursi/ *chair*, /'wilidhum/ *their son* /'niʕʒin/, /niʕ'ʒan/ *bake (active and passive),* /'kammil/, /kam'milt/ *finish (3rd person /1st person past form),* /'ʔuɣsil/, /ʔiɣsal/ *wash (imperative/ past form).* These practice items were extremely useful especially in the production of mixed conditioned items because the learners were required to produce the verbs in their inflected forms. Similar procedures were adopted to record the production and perception of stress by the native speakers. The only difference is that the translation in English was only added for the learners.

The production was recorded using a digital recorder M- Audio Micro-track-II professional 2-channel digital recorder. The device was set to 44.1 KHz as recommended by other researchers (Iverson et al. 2008). The researcher monitored the recording all the time.

In the production task, each picture was displayed on the researcher's laptop screen with a translated form in English. So if the picture exhibits a school, the English orthographic form *school* is also shown in the picture to avoid misinterpreting the target and producing an unwanted item. This was tested with the LA native speakers with no translated forms to guarantee the validity of the task. However, the researcher occasionally had to become involved in correcting the chosen item by asking the learner to repeat and consider an equivalent if possible and also to help generating some of the inflected forms. There was also a problem that they sometimes produced the required item but with /al/. So they were asked to repeat the word without the article. It is worth mentioning that the production task was challenging for the learners in the mixed conditioning patterns because the learners were required to produce the verbs in their inflected forms. However, the use of the practice items at the beginning of the test was helpful for the learners to understand the requirement of the task as mentioned earlier. Samples of the pictures used are shown below.[22]

- The target word is /'madirsa/ *school.*

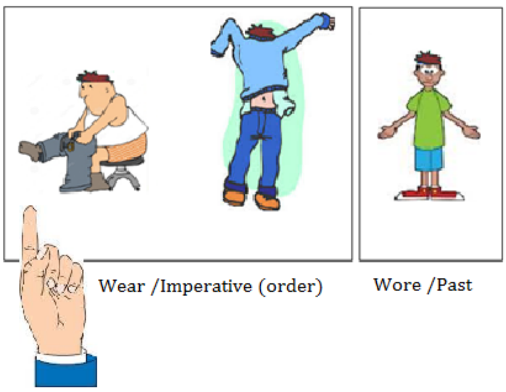
- The target word is /mid'zawwiʒ/ *married.*

[22] For a full list, please see appendix 7

The target word is /'ruʃin/ *window.*

Window

- The target words are the imperative/ past: /'(ʔ)albis, (ʔ)il'bas/ *wear*, wore



- The target words are the active/ passive: /'niktib, nik'tab/; *write, written*

(I) write | was written (by)

active | passive

Following Guion *et al* (2003, 2004); Altmann (2006) and Kijak (2009), the target item was elicited three times from the learners at a normal speech rate; only the second one was selected for scoring and analysis. The first and third items were excluded to avoid any fall in intonation or pitch in the latter or perhaps the learners being nervous and hesitating at the beginning. In the current study, participants were not asked to produce the target items in context due to the difficulty of eliciting sentences as the learners are not able to read LA. If learners were asked to put the items produced in a sentence of their choice this would result in an unsystematic list of sentences that were different for each participant-this method was adopted by Altmann (2006).

The stimuli for the perception test had been recorded in the voice of a female native speaker of Libyan Arabic aged 32. She was from Tripoli and lived in Tripoli. She reported that she has no knowledge of other languages. The recordings took place in the researcher's home in Tripoli in August 2012. The participants were asked to listen to the same words as used in the production task. They listened to each word three times: the first one was produced with intervals between syllables; the second and third time were produced spontaneously at a normal speech rate. The participants are asked to choose the most prominent syllable. The participants were given a sheet of paper with numbered lines. On each line, there were boxes equivalent to the number of the syllables in the word produced. Following Archibald (1993); Altmann (2006) and Kijak (2009), after the participants listened to the native speaker through headphones, they marked the box matching the syllable they thought was the most prominent and the loudest with emphasis on the piece of paper[23]. The participants decided when to move to the next item by

[23] See appendix 4 for the tasks and appendix 5 for the identification sheet.

clicking on a certain key. The participants were offered a five minute break after every 10 words or upon request.

4.5.5 Data Analysis and Scoring

Following Simon's method of evaluation (2009), the middle recordings of the three produced by each participant for each word in the production test were transcribed and evaluated by two phonologists (the researcher and another phonologist). Both judges independently located the stressed syllable based on the learners' production. Following Scholfield (2011, 1995), the reliability of assessment of the judges was measured using an absolute agreement scale. Ideally 60% agreement or better is required between the judges to show reliable location of the syllables stressed by the participants in the items (regardless of correctness).

If the judges did not agree on certain items, then an additional method of evaluation was adopted. 22 items where there was disagreement between judges were also evaluated by peer review in a phonology research group held at the University of Essex. The recordings of the items were also analysed using Praat on the researcher's computer. The target words were first copied from the recorder to a gold wave programme. The items are then prepared by determining the onset and offset of the second item produced audibly and then transferred to Praat to determine the acoustic cues such as pitch, intensity and duration in order to locate the stressed syllable. Examples of Praat images will be displayed in the next section.

To check the reliability of the sets of items representing each word pattern, Cronbach's alpha was calculated for the production and perception data for the learners using the correct scores for each person on each item. This assesses the consistency of participant response between the items (word tokens) which represent the same word pattern. A rule of thumb for deciding what is an adequate value of Cronbach's alpha is no less than .60 for the agreement (Larson-Hall, 2010). As Table 4.5 shows, all patterns achieved a high level of internal agreement apart from pattern (13).

Table 4.5: Cronbach's alpha Reliability

Word Patterns	Cronbach's alpha	Number of items
CV.cv.cv (1)	.891	3
cvc.CVC.cvc (2)	.693	5
cvc.CVC.cv (3)	.732	3
cv.CVC.cvc (4)	.750	3
CV.cvc.cv (5)	.775	5
CV.cvc.cvc (6)	.956	3
Cv.CV:.cv (7)	.968	3
cvc.CV:.cv (8)	.649	5
Cvc.cv.CV:C (9)	.791	3
cv:.CV:C (10)	.792	3
CV.cvc (11)	.941	3
cv.CVC (12)	.959	3
CV.Cv (13)	.148	4
CVC.cvc (14)	.939	4
CVC.cv (15)	1.00	4
CiC.cic (16)	.930	4
cic.CaC (16)	.926	4
CVC.cvc (17)	.707	3
cvc.CVCC (17)	.793	3
CaC.cic (18)	.910	4
cic.CaC (18)	.776	4

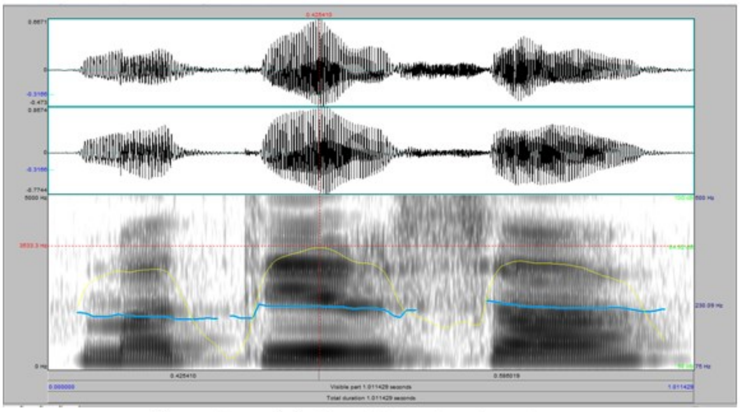
There were no missing items from the 76 in the participant data from either the production and perception task. To calculate accuracy, a score of 1 was assigned to the item if stress was produced or heard to be on the correct syllable based on the native speakers' production of LA, and a score of 0 was given if the choice was wrong. In order to determine statistically whether the learners made a clear decision about the stress placement in each pattern, three or two scores (depending on the word pattern) were created for each participant recording the number of tokens where that each syllable position was chosen as stressed for that pattern. 1 was given if the participant chose the ultimate syllable, 2 if they chose the penultimate, 3 if the participant chose the antepenultimate syllable. The data was entered into SPSS and a non-parametric Friedman test of differences with repeated measures was carried out (Larson-Hall, 2010; Scholfield, 2011) to analyse the results statistically with a significance level of 0.05. Bonferroni adjustment is used wherever multiple paired comparisons are made because of the fact that the same figures are being used in more than one comparison which might otherwise result in an over-estimate of significance. Generalised Linear Model was also carried out to calculate the effect of accuracy on different combinations of structures-to see the effect of syllable position, syllable closure and openness on correctness.

4.5.5.1 **Laboratory**

In this section, I will display a sample of Praat images of the words produced by the learners, showing how we determined which syllable they had stressed. These images display a spectrogram below and the waveform above. The blue line indicates intensity and the yellow line indicates the pitch. The images were used to ensure that the stress position in the words produced was evaluated accurately and in a systematic way. They were also useful for demonstration and support in the discussion chapters. [24] However, I have no intention of carrying out a phonetic analysis or measuring the correlates of stress phonetically in the current study.

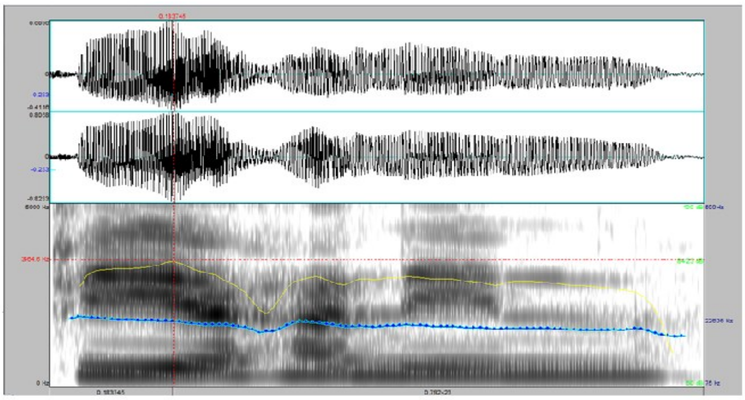
[24] For more samples see appendix 8

- Participant (1) produced the word /'**ma**dirsa/→[25] [ma'**dir**sa] *school* from pattern 5 with the heavy penultimate syllable as the stressed syllable. It can be noticed that the middle syllable has a higher pitch and stronger intensity.



/'**ma**dirsa/→ [ma'**dir**sa] *School*

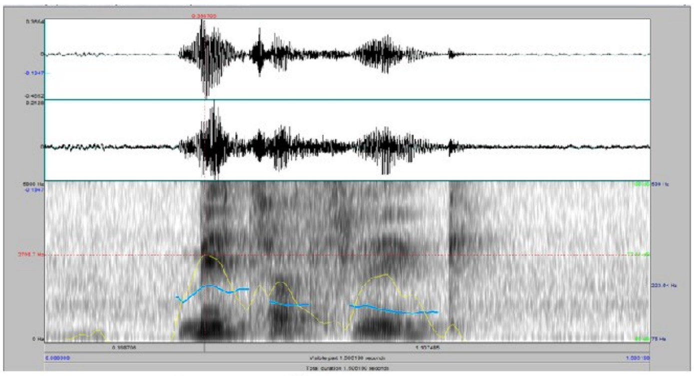
- Participant (1) produced the word /fir ħa 'niːn/ →['fir ħa nin] *happy pl* from pattern (9) with stress on the antepenultimate syllable. It can be noticed that the first syllable has a stronger intensity and higher pitch.



/fir ħa 'niːn/ →['fir ħa niːn] *happy pl*

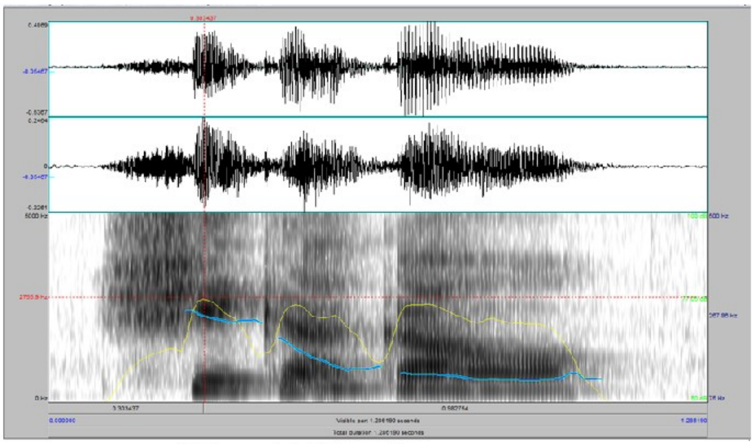
[25] The learners' IL version is on the right and the native speakers' version is on the left.

- Participant (5) produced the item /mit'ʕaflig/→['mitaflig] *angry* from pattern (2) with stress on the antepenultimate syllable in the CVC.CVC.CVC pattern and there was a change of the word pattern. The antepenultimate syllable is high in pitch and intensity as can be seen below.



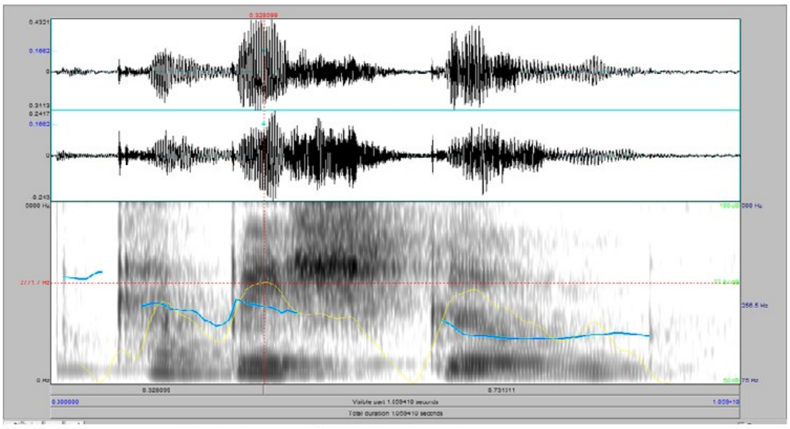
/mit'ʕaflig/→['mitaflig] *angry*

- Participant (13) produced /ʃig'ga:ga/→ ['ʃigaga] *money pot* from pattern (8) with stress on the antepenultimate syllable and again a change of word pattern to CV.CV.CV. The antepenultimate syllable is produced with heavier acoustic cues as displayed below.



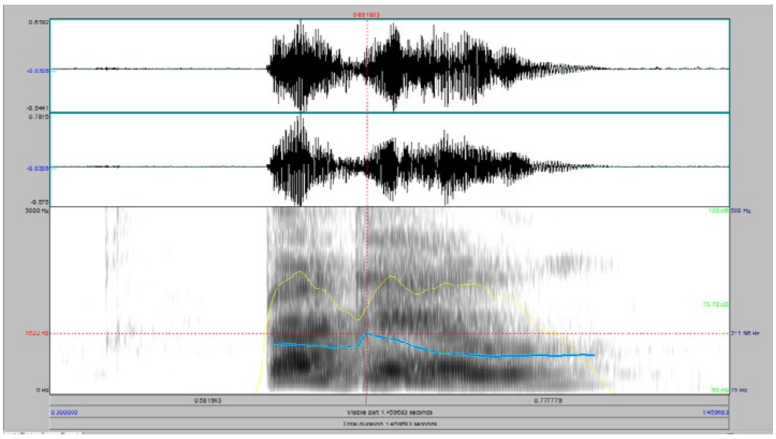
/ʃig'ga:ga/→ ['ʃigaga] *money pot*

- Participant (13) produced the word /'kabiʃkum/→[ka'biʃkum] *your ram* from pattern (6) with stress on the penultimate syllable. There is a slight rise in the pitch at the onset of the second syllable but the intensity is stronger than the rest of the syllables.



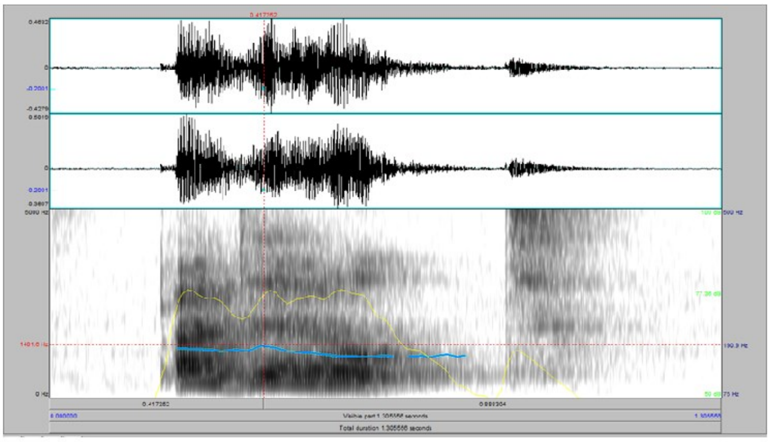
/'kabiʃkum/→[ka'biʃkum] *your ram*

- Participant (15) produced the item /'baddil/→[ba'del] *changed (3rd person)* from pattern (17) with stress on the ultimate and the geminate consonant is not produced. There is no huge difference in the intensity between the two syllables and there is a slight rise in the pitch in the second syllable.



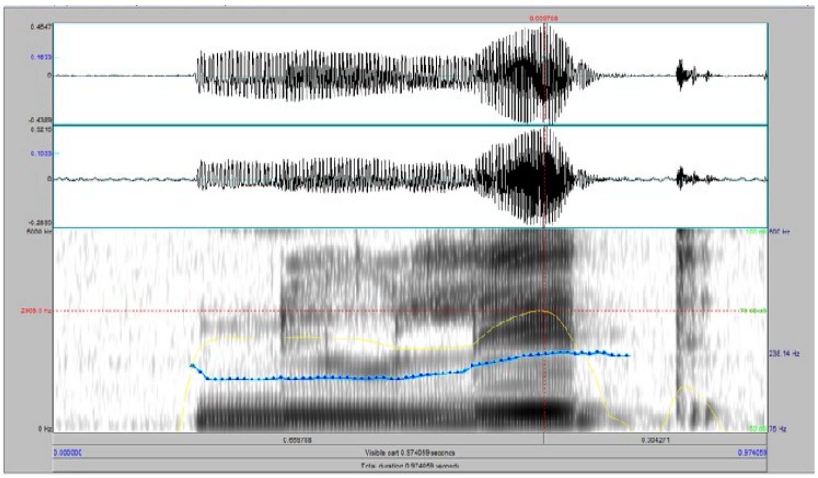
/'baddil/→[ba'del] *changed*

- Participant (15) pronounced /bad'dilt/→ [ba'dilt] *changed(1st person)* from pattern (17) with stress on the ultimate, which is correct, but the first geminate consonant is not pronounced. A steady intensity can be seen but a pinch of higher pitch at the beginning of the second syllable.



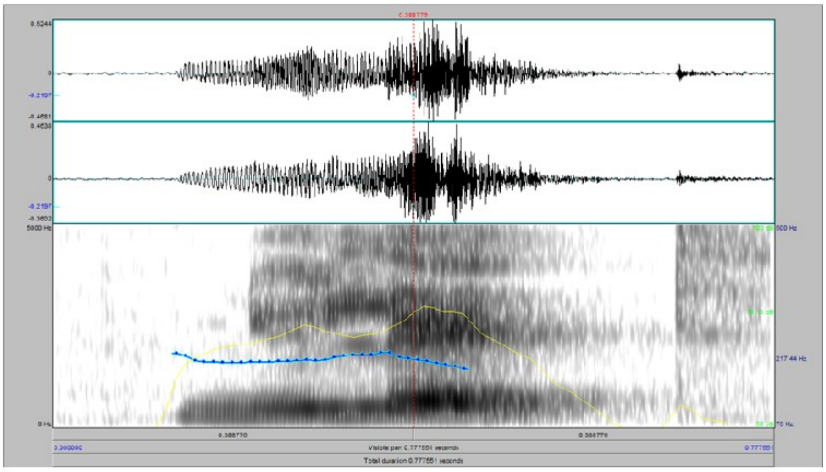
/bad'dilt/→ [ba'dilt] *had changed*

- Participant (11) produced item /'nuwlid/→[nuw'lid] *give birth* (v) from pattern (16) with stress on the ultimate syllable. Both intensity and pitch are higher compared to the penultimate one.



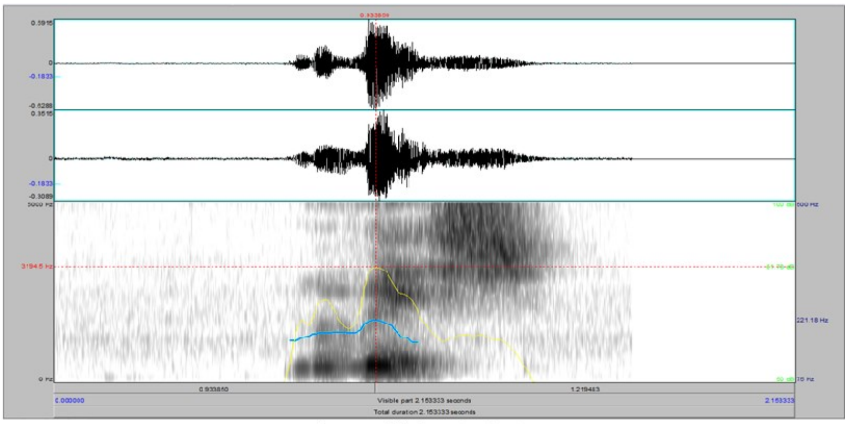
/'nuwlid/→[nuw'lid] *give birth* (v)

- Participant (11) produced the item /nuw'lad/→[nuw'lad] *was born* from pattern (16) with correct final stress. The acoustic correlates are stronger in the final syllable but the pitch falls suddenly as illustrated below.



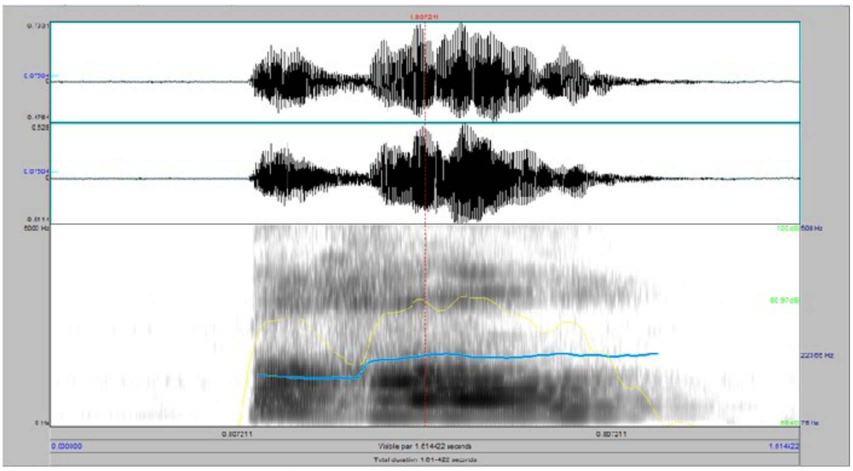
/nuw'lad/→[nuw'lad] *was born*

- Participant (5) pronounced the word /'muriʃ/→[mu'riʃ] *glass* from pattern (11) with final stress where the intensity peaks and the pitch shows a moderate rise as below.



/'muriʃ/→[mu'riʃ] *glass*

- Participant (15) uttered /ma'ħal/→[ma'ħal] *shop* from pattern (15) with stress correctly on the final syllable. Higher pitch, stronger intensity and longer duration accompany the ultimate syllable.



/ma'ħal/→[ma'ħal] *Shop*

4.6 Conclusion

In this chapter, first the LA stress pattern areas predicted to be likely to lead to English learner errors were explained, and linked to the word patterns tested in the study. Based on the similarities and the differences between the two languages, one violation of LA stress patterns by English learners is likely to occur word-finally in a syllable which has a long vowel and is closed by a consonant (CV:C). The second likely problem is related to the marked stress pattern when the weight of a syllable is somehow suppressed due to the vowel being epenthetic. In this case, the stress is placed on the light antepenultimate CV syllable, skipping the heavy penultimate CVC. A third problem concerns segmental influence on stress assignment, specifically vowel height. Geminate consonants affect the stress position as the learners shift the stress from the syllable that is closed by a geminate to the one that is opened by a geminate consonant; however, there are no word patterns designed to target geminates in this study. Finally, there are three likely problems when a stress change accompanies a grammatico-syntactic change. In LA this relates not so much to the verb/noun contrast but alternations of other grammatical categories of words such as the contrast between passive and active forms and the contrast between past and imperative forms.

In addition to the research questions, a three part Hypothesis was proposed concerning what learners might be expected to do (1) if the stress patterns match in the L1 and L2 and are unmarked, (2) if the stress patterns are similar but considered marked, and (3) if the stress patterns do not exist in L1. Next the pilot study was described, and what was learnt from it. Finally, a detailed account was given of the main study participants, instruments, word stimuli, procedures and data analysis, including means taken to make sure the data gathered was reliable and valid. In the next chapter, I will present the results of the production task for the native speakers and the learners.

5 Chapter Five: Production Results

5.1 Introduction

A detailed description of the results of the picture naming task will be presented in this chapter. The results of the main group, the English-speaking learners of Libyan Arabic, will be explained first, followed by the results of the native speakers of Libyan Arabic. The results are analysed by word patterns for each group, based on each of the phonologically conditioned patterns of trisyllabic words and phonologically conditioned patterns of disyllabic words, followed by the mixed conditions patterns (grammatical-phonological patterns). In the last two sections of this chapter, I will describe the effect of syllable position, the interaction between vowel length and syllable closure in the phonological patterns and the interaction between syllable position and vowel quality in the mixed conditioned patterns.

5.2 English-Speaking Learners of LA: Picture Naming Task

5.2.1 Phonologically Conditioned Patterns: Trisyllabic Words

5.2.1.1 CV.cv.cv Pattern (1)
/ˈʃarika/, /ˈsamaka/, /ˈmariga/

Each word is a noun with three open short vowel syllables, and antepenultimate stress. All the syllables contain full (unreduced) vowels. Since all the syllables have the same weight, this word pattern allows us to see how well the learners perform with stress placement based on position alone, with no differential syllable weight involved. Following H3-1, if the English-speaking participants adopt their L1 patterns, then correct choices will be made, since the patterns are the same and regular/unmarked in both languages. The final syllable will be excluded and the light antepenultimate one will be stressed as a result of the first two syllables being treated as a trochaic foot in both languages.

In fact, the responses in Table 5.1 show the majority of choices (57.8%) are correct which supports the above prediction, but not overwhelmingly. 42.2% of the choices are inaccurate. We may speculate that it is associated with loan words and thus with words that are perceived to be foreign and LA is clearly foreign too. Those loans do not reduce vowels; for foreign words cv.CV.cv and unreduced V are the unmarked choice in English, so a natural choice for new foreign words in an L2. Alternatively, maybe they are misled by the lack of vowel reduction, as the three syllables are produced with full vowels in the L2. Interestingly, nearly half of the learners who incorrectly stressed the penultimate syllable also changed the quantity of the vowel and lengthenedthe vowel. In quantity sensitive languages, stress is generally associated with syllable weight so it is marked to have a stressed syllable that is not also heavy. Perhaps the learners are reverting to a universal rather than just their L1 when they lengthen what they stress (cf. H2).

The results of the production of pattern (1) CV.cv.cv in the picture naming task are summarised in Table 5.1.

Table 5.1: The Learner Production Results for Pattern (1)[26]

CV.cv.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	26	**57.8%**	**Correct**	46.2	.0	100.0
Penultimate	15	18	40.0%	Incorrect	47.5	.0	100.0
Ultimate	15	1	2.2%	Incorrect	8.6	.0	33.3

[26] Std. D refers to Standard Deviation.

A non-parametric Friedman test of differences with repeated measures was carried out and yielded a Chi Square value of 9.04 which was significant ($p = 0.011$). A pairwise post hoc comparison between the pairs was run and it emerged that the difference in choices between the antepenultimate and penultimate syllables was not significant (Chi Square = 0.60, $p = 0.439$, Bonferroni adjusted $p = 1$). However, the difference between the antepenultimate and the ultimate syllable was highly significant (Chi Square = 10, $p = 0.002$, Bonferroni adjusted $p = 0.006$) and the difference between the penultimate and ultimate syllables was slightly significant (Chi Square = 4.50, $p = 0.034$, Bonferroni adjusted $p = 0.102$). This means that the position that is selected considerably more often by the learners is the antepenultimate syllable over the other syllables but also that the penultimate syllable was a strong second choice for the learners.

5.2.1.2 cvc.CVC.cvc Pattern (2)
/mid.'zaw.wiʒ/, /mid.'bah.dil/, /mis.'taw.Sif/, /mit.'ʕaf.lig/, /mus.'taq.bil/

This word pattern is represented by nouns and adjectives – each of the words is composed of three closed CVC syllables with stress on the penultimate one. The three syllables are produced with full vowels. Along with pattern (1) it allows us to see how well learners do when stress is placed based on position alone, rather than differential syllable weight. If the English participants transfer their predictable L1 stress patterns as in LA, the final syllable will be excluded; and as a result of building two trochaic feet on the antepenultimate and penultimate syllables, the rightmost penultimate syllable will be stressed. If we agree that the word pattern of *fan'tastic* is the unmarked one within English, then what about *'selfishness*? Can one really say there is a clear default/unmarked choice in English? If the L1 has more than one stress position for word pattern 2 and none is a clearly unmarked one; then one would expect transfer of both which would appear as a mixture of negative and positive transfer, unless we assume that one of them is favoured by universal unmarkedness trends. Thus H3-1, as for word pattern (1), predicts that our learners should produce this pattern with the correct stress.

This pattern displays interesting results for two reasons: the majority of responses show that learners prefer to stress the antepenultimate syllable in 41.33% of the responses, rather than the penultimate syllable, yet this pattern contradicts their regular L1 stress patterns. There are also a very few cases where the learners create four syllables by inserting a vowel after the penultimate syllable which makes the coda of the penultimate syllable an onset of the inserted vowel. This leads to the generation of a CVC.cv.cv.cvc /mid.ba.ha.dil/ or cvc.CV.cv.cvc /mis.ta.wa.sif/ structure. Table 5.2 shows that a pre-antepenultimate syllable is created in 8% of the cases. That is slightly above 5%, so it is not totally random variation as stated by Archibald (1993), who proposes that any performance score of more than 5% should be treated as being the result of common errors.

Interestingly, there is also a small number of cases where the structure is re-syllabified by the learners. For example, the /ʕ/ is deleted, the /f/ is maximised as an onset of the following syllable and /t/ becomes the onset of the peak of the penultimate syllable in /mit.'ʕaf.lig/, becoming /'mi.ta.flig/. There are cases where the coda of the penultimate syllable is deleted; consequently CVC.cv.cvc/cvc.CV:.cvc patterns are formed instead. So /mid.'zaw.wiʒ/ becomes /'mid.za.wiʒ/ and /mid.'bah.dil/ becomes /mid.'baː.dil/ - the position of stress in the latter is not affected. The learners alter the word syllable pattern based on their difficulty in producing (and maybe originally hearing) the pattern. Therefore, one might suggest that this finding implies that the pattern of a sequence of three closed CVC syllables is not acquired straightforwardly and it created difficulties for the learners despite the prediction of H3-1 – more details are in the discussion chapter.

Table 5.2: The Learner Production Results for Pattern (2)

cvc.CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Pre-antepenultimate	15	6	8.0%	Incorrect	21.1	.0	60
Antepenultimate	15	31	41.3%	Incorrect	31.6	.0	100
Penultimate	15	26	**34.7%**	**Correct**	30.7	.0	100
Ultimate	15	12	16.0%	Incorrect	31.4	.0	100

In Table 5.2, it can be seen that only 34.7% of cases have stress correctly assigned on the penultimate syllable, which is a low success rate. It can also be observed that the antepenultimate syllable competes with the penultimate one for stress assignment; however, the pre-antepenultimate and the ultimate syllables are less favoured in this pattern. The uncertainty of responses made by the learners can be attributed to the complexity of the structure itself.

This is reflected in the statistical analysis as explained below. The Friedman test showed an overall significant difference between the responses made by the learners in assigning stress to the different syllables (p = 0.010; Chi-Square = 11.31). Paired comparison tests showed that the difference in the responses, in particular between the antepenultimate and penultimate syllables, is not significant (Chi Square = 1.14, p = 0.285, Bonferroni adjusted p = 1). Regardless of the correctness of stress, this indicates that no strong preference is shown and that the penultimate position was a second choice after the antepenultimate syllable. Out of all the six paired comparisons between positions, the difference between the antepenultimate and pre-antepenultimate syllables as well as between the penultimate and ultimate syllables was nonsignificant (p = 0.035, Bonferroni adjusted p = 0.210); the difference between the pre-antepenultimate and penultimate syllables was near significance (p = 0.013, Bonferroni adjusted p = 0.078) and the difference between the antepenultimate and ultimate syllables was also nonsignificant (p

= 0.052, Bonferroni adjusted p = 0.312). Based on these results, the four syllable positions can be divided into two sets. On the one hand, there was a similar higher level of response involving stress on the antepenultimate and penultimate syllables, and on the other hand, there was comparable lower level of response selecting the pre-antepenultimate and ultimate syllables.

5.2.1.3 **cvc.CVC.cv Pattern (3)**
/mus.'taʃ.fa/, / mux.'til.fa/, /mix.'tim.ra/

This word pattern is exemplified by nouns and adjectives with penultimate stress. The items are composed of two closed syllables followed by an open final syllable, so stress is not positioned totally without regard for syllable weight as is the case for patterns (1) and (2). If English-speaking learners apply their L1 regular pattern, then the penultimate syllable will receive stress after excluding the final syllable and building two bimoraic feet on the antepenultimate and penultimate syllables and choosing the right most foot. Hence with H3-1 we predict no problem for them in positioning stress correctly.

It is evident in the table below that the learners do indeed strongly favour the penultimate syllable (77.8%) over the antepenultimate one (15.6%) which means that the learners either acquire the L2 predictable pattern or transfer their L1 regular pattern. This supports what we said in H3, that the learners perform better when the L1 and L2 are matched. It is also difficult to find an explanation for the antepenultimate choice. It may be attributed to transfer, as the L1 might receive stress on the antepenultimate syllable as in '*Timbucktoo* but it is against the regular phonological patterns; furthermore, stressing the antepenultimate syllable is considered to be an exception in this pattern.

Table 5.3: The Learner Production Results for Pattern (3)

cvc.CVC.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Pre-antepenultimate	15	1	2.2%	Incorrect	8.6	.0	33.3
Antepenultimate	15	7	15.6%	Incorrect	30.5	.0	100.
Penultimate	15	35	**77.8%**	**Correct**	34.9	.0	100.
Ultimate	15	2	4.4%	Incorrect	11.7	.0	33.3

The Friedman Test confirmed that syllable position overall is highly significant in the assignment of stress in this pattern (Chi Square = 25.80, $p < 0.001$). Further statistical analysis confirms that the responses which involve assigning stress to the penultimate syllable are significantly different from the antepenultimate ($p = 0.005$, Bonferroni adjusted = 0.03), ultimate ($p < 0.001$) and pre-antepenultimate syllables ($p = 0.001$, Bonferroni adjusted = 0.006). Other pairs did not yield significant results. Thus a clear preference is made for the correct choice alone – the penultimate syllable - supporting H3-1.

5.2.1.4 **cv.CVC.cvc Pattern (4)**
/mu'handis/, /ʕa'bamber/, /mu'darris/

Each of these items is a noun with penultimate stress. There is even less reason to stress the antepenultimate position here than in word pattern (3), since it is a light syllable. Comparing the patterns CV.cv.cv (1), cvc.CVC.cvc (2) and cvc.CVC.cv (3) with cv.CVC.cvc (4), pattern (1) and (2) are, as we noted, composed of syllables with balanced weight patterns, whilst (3) contains a final light syllable but it is mostly excluded. Therefore, the first three patterns compete only on syllable position as a factor in stress location, in particular, the antepenultimate and penultimate syllables (if we assume that the final one is excluded). Indeed, looking at Table 5.3, the ultimate position hardly receives any stress. Pattern (4) however, is supposed to represent stress location based on both syllable position and syllable structure (openness and closure, creating lightness and heaviness).

Furthermore, the predictable stress patterns of both the L1 and L2 favour placing stress in the penultimate position which contains a heavy syllable. The heavy syllable will attract stress and the antepenultimate one will be left unparsed according to the regular stress patterns of the L1 and L2. Thus again, H3 predicts that there should be few errors produced by our learners.

Unsurprisingly, then, the penultimate syllable is most preferred, with a score of 95.6%. This reflects that the L1 and L2 closely match and both follow the predictable stress pattern of quantity sensitive systems, as per H3-1.

Table 5.4: The Learner Production Results for Pattern (4)

cv.CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	0	0.0%	Incorrect	.0	.0	.0
Penultimate	15	43	**95.6%**	**Correct**	17.2	33.3	100
Ultimate	15	2	4.4%	Incorrect	17.2	.0	66.7

Only the penultimate and ultimate positions were used as variables when conducting the nonparametric test, since the antepenultimate position has a score of 0. Statistical analysis confirms that there is a significant difference in the rate of selection of the penultimate and the ultimate positions (Chi Square = 11.27, $p < 0.001$). This confirms that the learners do predominantly choose one position.

5.2.1.5 **Cv.cvc.cv Pattern (5)**
/'mazirʕa/, /'madirsa/, /'makinsa/, /'makitba/, /'basimta/

Each item is a noun with antepenultimate stress. This word pattern is composed of a light antepenultimate syllable followed by a sequence of superficially heavy penultimate and light ultimate syllables. If the learners follow their predictable L1 stress patterns, then they would incorrectly stress the heavy penultimate syllable (Chapter 3) as in *ve'randa* and *bo'nanza* but if they follow the irregular pattern, then learners might skip the heavy penultimate syllable and stress the light antepenultimate one as in *'faculty, 'cavalry, 'galaxy.* It is obvious in the table below that the learners transferred the regular pattern and stressed the heavy penultimate syllable (74.7%) and only a low percentage of items (17.3%) received antepenultimate stress. This performance does not match the L2 patterns as this pattern receives stress on the light antepenultimate syllable in LA, skipping the heavy penultimate one. In terms of H3, the findings support the prediction of H3-2, where errors would be predicted.

Table 5.5: The Learner Production Results for Pattern (5)

CV.cvc.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	13	**17.3%**	**Correct**	28.1	.0	100
Penultimate	15	56	74.7%	Incorrect	36.6	.0	100
Ultimate	15	6	8.0%	Correct	25.9	.0	100

Table 5.5 shows that the responses obtained in words with a combination of a light (open) syllable followed by heavy (closed) syllable mostly stressed the heavy penultimate syllable. These results mirror the stress placement obtained in pattern (4). That is, the learners produced stress on the penultimate syllable in the vast majority of cases. The difference between pattern (4) and (5) lies in that, in the latter, the penultimate syllable

incorrectly attracts stress while in the the former it correctly attracts stress. Regardless of the correctness of responses, the learners in these two patterns basically target the closed penultimate syllable. The low performance of the participants might be attributed to the mismatch in the application of stress patterns between their L1 and the L2 in this pattern and also the fact that this pattern represents unpredictable patterns in both the L2 and L1.

The Friedman test again showed a significant difference among syllable positions (Chi Square = 14.92, $p > 0.001$). Pairwise post hoc comparisons further confirm a significant difference in the number of responses stressing the antepenultimate and penultimate syllables (Chi Square = 7.14, $p = 0.008$, Bonferroni adjusted = 0.024) and between the penultimate and the ultimate syllables (Chi Square = 9.31, $p = 0.002$, Bonferroni adjusted = 0.006). However, the response differences between the antepenultimate and ultimate syllables are nonsignificant (Chi Square = 4.50, $p = 0.034$, Bonferroni adjusted = 0.102). This means the learners treated the syllable positions unequally and statistically favoured the penultimate one over the other two positions, making a clear cut decision on what syllable position was being stressed.

5.2.1.6 **CV.cvc.cvc Pattern (6)**
/'ka.biʃ.kum/, /'ma.lik.hum/, /'ga.bil.kum/

Each item of this pattern is composed of two morphemes: a free morpheme which has a structure of CV.cvc (pattern 11) with penultimate stress and a bound morpheme which is composed of CVC. So although the syllable pattern is superficially identical to Pattern (4), the words combinations of nouns with possessive morphemes */'kabiʃ+kum/ /'malik+hum/ /'gabil+kum/,* the attachment of the bound morpheme to the stem does not affect the stress position in LA in this pattern (see Chapter 3). Therefore, stress does not shift to the heavy penultimate position but instead the light antepenultimate one retains stress. This applies to some suffixes but not others in English (see Chapter 3). It falls into

H 3-1, since both the L1 and L2 assign stress before adding suffix inflections. The prediction of no problem is incorrect because the majority of learners assign stress to the penultimate syllable, following the same preference for the unmarked heavy syllable seen in Pattern 4. In terms of H3, the findings again support the prediction of H3-2, where errors would be predicted. This leads them to treat the final syllable as being excluded from stress assignment in 80% of cases and the antepenultimate syllable is unparsed in 77.8% of cases, because it is light.

Table 5.6: The Learner Production Results for Pattern (6)

CV. cvc.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	10	**22.2%**	**Correct%**	41.1	.0	100
Penultimate	15	26	57.8%	Incorrect%	49.5	.0	100
Ultimate	15	9	20.0%	Incorrect%	41.4	.0	100

The Friedman test fails to show a clearly significant difference among the three positions (Chi Square = 4.74, p = 0.094) so no further statistical analysis is needed. This shows that the learners' preference for the penultimate position for stress was not clear-cut.

5.2.1.7 **cv.CV:.cv Pattern (7)**
/ru'zaːtˤa/, /ʃi'ba:ni/, /ʕi'ma:ra/

This word pattern, like patterns (3) – (8) in general, does not include balanced-weight syllables: in this case the penultimate position is composed of an open syllable with a long vowel, quite parallel with pattern (5) which also has a light-heavy-light sequence of syllables, but with the difference that there is no doubt about the true weight of the penultimate syllable in this pattern, so it receives stress as normal in LA (Chapter 3). Hence if the learners transfer the predictable stress pattern of their L1, then the final position is excluded and the penultimate syllable constitutes a trochaic foot while the antepenultimate one is left unparsed. Thus H3-1 predicts correct performance on this pattern. This is supported by the performance of the participants (Table 5.7). The majority of the learners (66.7%) correctly produced the penultimate syllable as the stressed one. 31.1% of responses placed stress on the antepenultimate syllable and only 2.2% of cases on the ultimate one.

Table 5.7: The Learner Production Results for Pattern (7)

cv.CV:.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	14	31.1%	Incorrect	46.2	.0	100
Penultimate	15	30	**66.7%**	**Correct**	48.8	.0	100
Ultimate	15	1	2.2%	Incorrect	8.6	.0	33.3

The Friedman test yielded an overall significant result (Chi Square = 8.52, p = 0.014). Fine-grained follow up tests confirm that there is a significant difference between the responses which stress the penultimate and ultimate syllables (Chi Square = 7.36, p = 0.007, with a Bonferroni correction applied, p = 0.021). The difference in responses between the antepenultimate and the ultimate syllables is close to significance at (Chi Square = 5, p = 0.025, Bonferroni adjusted = 0.075). However, the difference in responses between the penultimate and antepenultimate syllables is nonsignificant (Chi Square = 1.67, p = 0.197, Bonferroni adjusted p = 0.591).

5.2.1.8 **Cvc.CV:.cv Pattern (8)**
/sfan'na:ri/, /dar'buːka/, /ʃig'ga:ga/, /gar'ʒu:ma/, / xan'fu:sa /

Each item is a noun with a sequence of two heavy syllables followed by an open light one, as in Pattern (3), and again stress is on the penultimate syllable. The heavy syllables differ in their structure: a closed syllable with a short vowel followed by an open syllable with a long vowel. If the predictable L1 stress pattern is transferred, the final syllable is expelled from stress assignment, the antepenultimate and penultimate syllables will form trochaic feet and the right-most foot would attract the stress. So following H3-1, the learners should not have a problem in producing this pattern.

Indeed, the learners produced the words with penultimate stress in most of the words (60%) which supports the above prediction. The errors all involved assigning stress to the antepenultimate position (40%).

Table 5.8: The Learner Production Results for Pattern (8)

cvc.CVː.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	30	40.0%	Incorrect	32.1	.0	100.0
Penultimate	15	45	**60.0%**	**Correct**	32.1	.0	100.0
Ultimate	15	0	0	Incorrect	0	0	0

Only the antepenultimate and the penultimate syllables were compared in the Friedman test as no items received stress on the ultimate syllable (Table 5.8). The result shows that the comparison between instances of stress assignment in the antepenultimate and penultimate is statistically nonsignificant (Chi Square = 0.067, p = 0.796). This means that the two syllable positions are chosen, to some extent, equally and no major preference is seen. In effect, two stressed syllable options are found in the learners' performance, with the antepenultimate position coming second. Statistically, H3-1 is not fully supported.

5.2.1.9 **cvc.cv.CV:C Pattern (9)**
/buk ki 'ʃaːʃ/, /manda'liːn/, /fir ħa 'niːn/

This category is composed of three syllable words with a final superheavy syllable which attracts stress (Chapter 3), which sets this apart from all the other LA trisyllabic patterns we have covered above. Neither the default penultimate nor the heavy antepenultimate syllable receives stress in this pattern in LA. Only if learners were to transfer what is a marked pattern in L1 would they not treat the ultimate syllable as extrametrical and so might stress it. If, however, learners excluded the final syllable from stress computation, as this is the unmarked choice within English nouns, the stress would be incorrectly assigned to the antepenultimate syllable as it is heavy, while the penultimate one would not attract stress because of its light structure, bearing in mind that both L1 and L2 are quantity sensitive languages. Thus H3-2 predicted learner problems with this pattern. In fact, the results show that the learners incorrectly assigned stress to both the antepenultimate (37.8%) and surprisingly penultimate syllables (33.3%) and produced the syllable bearing the correct stress assignment in only 28.9% of instances.

Table 5.9: The Learner Production Results for Pattern (9)

cvc.cv.CV:C	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	17	37.8%	Incorrect	35.4	0	100.0
Penultimate	15	15	33.3%	Incorrect	30.9	0	100.0
Ultimate	15	13	**28.9%**	**Correct**	37.5	0	100.0

Table 5.9 shows that learners produce stress on the three syllable positions almost equally in this word pattern. The statistical analysis revealed a nonsignificant difference between the number of instances allocated to each syllable position by the L2 speakers (Chi Square = 1.11, p = 0.575). Thus great uncertainty as to which syllable is the stress bearer was statistically attested, supporting H3-2.

5.2.1.10 **Summary of Learner Results for Trisyllabic Word Production**

Figure 5.1: Phonologically Conditioned Stress Patterns of Trisyllabic Words in Learner Production

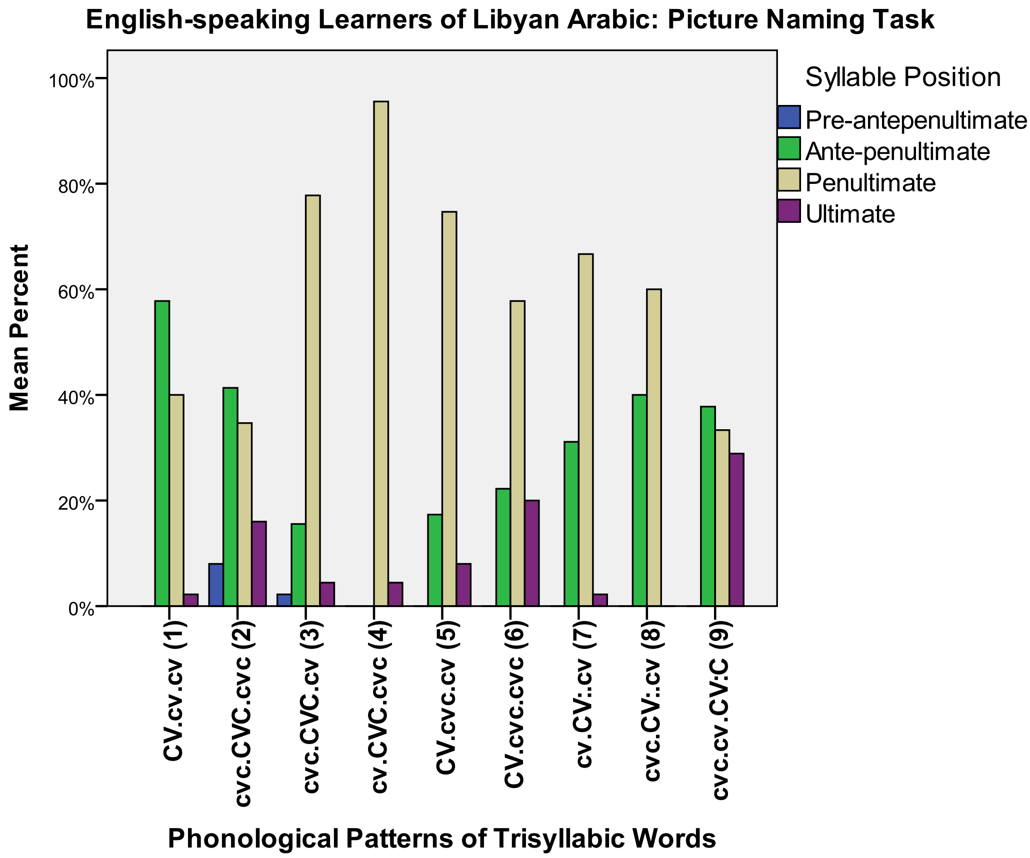


Figure 5.1 includes the mean percent of stress choice responses for trisyllabic phonological conditioned patterns (the actual stressed syllable is written in capitals CV, CVC or CV:C). Each bar represents a syllable position. Regardless of correctness and generally speaking, the ultimate syllable was the least favoured position, especially if it is a CV structure. This can be taken as evidence that the final position was excluded from the stress computation. This fact does not largely change if the final syllable is CV:C or CVC, as they also receive little stress assignment, which is consistent with these syllables being treated as extrametric, as predicted from the analysis of English (in Table 5.1). The

antepenultimate syllable is the second favoured, but its choice is affected by syllable weight, so if the antepenultimate syllable contains a light CV then it would be avoided unless there was no alternative heavy syllable in the word. The penultimate syllable is the most favoured position to attract stress – there were also instances when the penultimate syllable was lengthened to provide a better landing site for the stress (Patterns 9 and 1). It seems the learners made a generalization about syllable weight and syllable position. This issue will be examined further in the subsequent chapters.

The structure of some patterns was more problematic than others. The learners were uncertain about which syllable should bear the stress, resulting in low accuracy rates in patterns (2) and (9). In pattern (5), although the learners did not treat the syllable positions equally and showed a clear preference for a particular position, performance was still low. Unexpectedly, a sequence of two closed syllables CVC.CVC in the antepenultimate and penultimate positions, in patterns (2) and (3) were modified by restructuring the pattern or creating a new syllable that then received stress. Comparing pattern (6) to (4), bearing in mind the difference between them only lies in the stress position, both patterns mainly accepted stress on the penultimate syllable, regardless of its underlying representation.

In terms of predictability, my interpretation is that patterns (5) and (6) in LA exhibit unpredictable patterns which are not accessible in the L2. Patterns (2) and (9) exhibit complexity in structure - this supports H 3-2. The former is less frequent in English than in LA and than the alternative pattern CVC.cvc.cvc. The latter violates the English extrametricality condition, plus the length of the Arabic vowels is not easily perceived. The long and short vowels are only distinguished in terms of quantity and they share exactly the same quality (Kopczynski and Meliani, 1993) so occasionally CVC and CVːC structures are difficult to distinguish. Patterns (1), (3), (4), (7) and (8) exhibit to some extent predictable stress patterns in terms of following the quantity sensitivity requirement and consequently the learners' performance was higher in these patterns - this supports H 3-1.

5.2.2 Phonologically Conditioned Patterns: Disyllabic Nouns

5.2.2.1 **cv.CVːC Pattern (10)**
/fla'liːs/, /ki'saːn/, /ɣa'fi:r/

Each item is a noun with stress on the ultimate syllable. It is composed of a light penultimate syllable, followed by a superheavy final one. If the final syllable is superheavy it is stressed in LA, whether in a noun or a verb, but in English this superheavy final syllable can be avoided as a stress-receiving site. The result for this pattern is however not decisive because the responses obtained from the production of the words show an almost equivalent preference for either position; hence H3-1 is not supported. In fact, just about the half of the responses 51.1% carried stress on the ultimate syllable and just below half of the cases 48.9% had stress on the penultimate one. Descriptively, the learners were undecided; despite its availability in their L1. It could be that some words in English are pronounced either as **'***garage or ga'rage* so could that be transferred? Alternatively, factors other than transfer such as personal preference might be involved in making these errors. This supports the above claim that as the quality and the quantity of vowels are totally different in the both languages, perhaps their perception of the stress position in the words, and hence their production, might be affected. This will be examined further in the discussion chapters.

Table 5.10: The Learner Production Results for Pattern (10)

cv.CV:C	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	22	48.9%	Incorrect	43.4	.0	100
Ultimate	15	23	**51.1%**	**Correct**	43.4	.0	100

Unsurprisingly, the difference between the two positions is nonsignificant (Chi Square = 0.07, p = 0.796). So this pattern appears harder to acquire.

5.2.2.2 **CV.cvc Pattern (11)**
/'muriʃ/, /'ruʃin/, /'ħabil/

This word pattern is composed of a light penultimate syllable followed by heavy ultimate syllable containing a high vowel. Each of these items is a noun with penultimate stress. If the learners apply the rules of their L1, then they would achieve a correct response. After excluding the final syllable from stress assignment as it contains a high vowel, the only syllable available is the light penultimate one.

However, these results mirror of those in pattern (10), because the L2 speakers are once more unclear about which syllable stress should be assigned to. 44.4% of instances are incorrect, where the final CVC received stress, and the correct responses are marginally above at 55.6%, where the light penultimate syllable properly accepted stress. It may be the result of an interaction between the position of the actual stress and its structure. The stress occupies the penultimate position which is considered a default position but the structure of the syllable is a light CV, which is not attractive to stress. The learners revert to the default structure of CVC in accordance with the requirement of heavy quantity sensitivity languages (H2).

Table 5.11: The Learner Production Results for Pattern (11)

CV.cic	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	25	**55.6%**	**Correct**	48.3	.0	100
Ultimate	15	20	44.4%	Incorrect	48.3	.0	100

A Friedman test confirms that there is no significant difference between the number of items produced by the learners with stress on the penultimate and the ultimate syllables (Chi Square = 0.60, p = 0.439).

5.2.2.3 **cv.CVC Pattern (12)**
/ma'ħal/, /ʃi'jar/, /ma'mar/

This class of items is the counterpart of the previous one in that an open syllable precedes a closed syllable, but there is a key difference in the vowel height in the final syllable, which is low rather than high. In LA, different from English, the extrametricality process is blocked and the light CV rejects stress in the presence of the low vowel in a specific phonological environment (see Chapter 3). Hence, the ultimate syllable carries the stress in this pattern. Following H3-2 (4.3), the prediction here is that the learners would not perform accurately as the final syllable is not the unmarked option in their L1 and L2. Hence they might show uncertainty about their choices, or they might favour the penultimate syllable despite its structure.

Unexpectedly, the L2 speakers showed a preference for the ultimate position, accompanied by a lengthening of the vowel, despite the aversion to this location as seen before in trisyllabic words (patterns (2), (4), (6) and (9)). In fact, 75.6% of items correctly received stress on the ultimate syllable and only 24.4 % of items incurred incorrect stress assignment when the light CV was the stress holder.

Table 5.12: The Learner Production Results for Pattern (12)

cv.CaC	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	11	24.4%	Incorrect	42.7	0	100
Ultimate	15	34	**75.6%**	**Correct**	42.7	0	100

Descriptive analysis shows that the difference between the numbers of instances where stress is allocated to the penultimate and ultimate syllables is large. The Friedman test however did not quite reach significance (p = 0.071, Chi Square = 3.27). This could be due to the high standard deviations, showing that participants differed widely from each other in their performance on this pattern.

5.2.2.4 **CV.CV Pattern (13)**
/ˈɣaba/, /ˈlutˤa/, /ˈtˤawa/, /ˈbala/

Each item is a noun composed of two light syllables, making this is the two syllable equivalent of pattern (1). Both the L1 and L2 are trochaic with stress on the penultimate syllable in this pattern. Syllable weight is not involved in this pattern as it is a balanced-weight category and none of the vowels is reduced in LA. This pattern should be straightforward and should not cause a problem for the learners as predicted by H3-1.

Table 5.13: The Learner Production Results for Pattern (13)

CV.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	57	**95.0%**	**Correct**	10.4	75.0	100
Ultimate	15	3	5.0%	Incorrect	10.4	.0	25.

Indeed, the vast majority of the responses were produced with penultimate stress (95%) and only 3 items received stress on the ultimate syllable as shown in Table 5.13. Statistical analysis confirms that the two syllable positions are treated unequally. There was a significant difference between the distribution of number of instances allocated to each position (Friedman test Chi Square = 15.0, p < 0.001). The result is highly significant, confirminga clear preference.

5.2.2.5 **CVC.cvc Pattern (14)**
/'filfil/, /'maktib/, /'maxzin/, /'mafriʃ/

Each word is a noun with a structure composed of two balanced-weight syllables, similar to pattern (2); the stress position can therefore be computed for this pattern based only on syllable position. Once again, the majority of items were produced with penultimate stress as predicted and based on what is unmarked in the L1 (H3-1).

Table 5.14: The Learner Production Results for Pattern (14)

CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	55	**91.7%**	**Correct**	26.2	.0	100
Ultimate	15	5	8.3%	Incorrect	26.2	.0	100

As indicated in Table 5.14, 91.7% of learner responses carried penultimate stress while only 5 were produced with ultimate stress. The Friedman test determined that there was a significantly greater tendency to stress the penultimate syllable in disyllabic words that contain balanced weight syllables (Chi Square = 11.27, p = 0.001).

5.2.2.6 **CVC.cv Pattern (15)**
/'ʃibka/, /'ʃarba/, /'ħufra/, /'bugra/

This pattern is represented by nouns with a heavy closed syllable followed by a light one, and occurs with penultimate stress in LA. The responses obtained from the L2 learners reached the ceiling, as all items were produced correctly. It seems that this pattern is

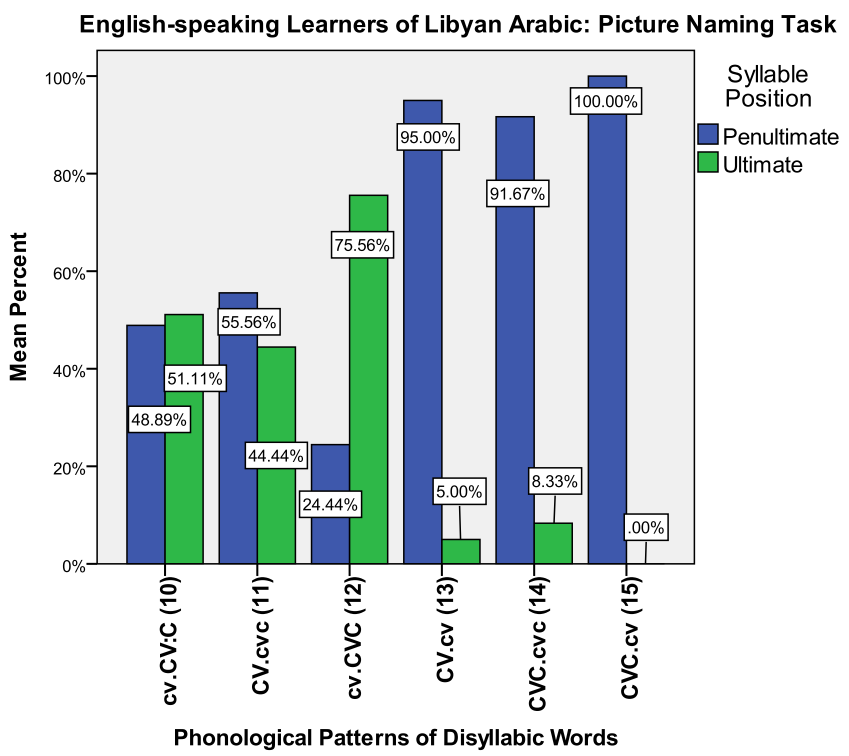
100% acquired regardless of the varied levels of proficiency of our participants, and it does not cause any difficulty. The reason behind this performance is that this word pattern occurs in both languages and has an unmarked stress position in both languages. Patterns (13), (14) and (15) fall under H 3-1. As a result of the ceiling effect, no further statistical analysis is required.

Table 5.15: The Learner Production Results for Pattern (15)

CVC.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	60	**100%**	**Correct**	.0	100.0	100
Ultimate	15	0	.0%	Incorrect	.0	.0	.0

5.2.2.7 Summary of Learner Results for Disyllabic Word Production

Figure 5.2: Phonologically Conditioned Stress Patterns of Disyllabic Words in Learner Production



Patterns (10) and (11) showed nonsignificant results which implies that the L2 speakers could not reach a decision and consequently each syllable was chosen more or less equally. Comparing pattern (11) CV.cvc with (12) cv.CVC and (15) CVC.cv might give us an indication as to why pattern (15) resulted in a ceiling effect? It seems that pattern (15) satisfies both important criteria for the learners: the default position and also the default structure. The default position is the penultimate position that is occupied by the default structure CVC.

Patterns (13), (14) and (15) are similar and predictable so the performance is great as predicted by H 3-1. However, in patterns (10), (11) and (12), the learners set up a configuration based on the default syllable structure and the default position that determine the stress in their interlanguage, as predicted by H 2.

5.2.3 Mixed Conditioned Patterns: Disyllabic Verbs

In the mixed conditioned category, both phonology and syntax are involved in the process of assigning stress to disyllabic verbs. So features such as voice, tense, person or mood of verbs are changed based on a phonological change. A shift of stress from the penultimate to the ultimate syllable occurs with a change in the height of the peak of the ultimate syllable, or with a change to the weight of the syllable, both of which we have also seen in the patterns above. This is seen in our three last patterns.

5.2.3.1 **CVC.cvc/cvc.CVC (Active/Passive) Pattern (16)**[27] **/'niglib/- /nig'lab/, /'nuwlid/- /nuw'lad/, /'niktib /nik'tab/, /'nirsim/ nir'sam/**

This word pattern is composed of two subcategories: the active voice of the verb and its passive past form. Both subcategories are composed of two heavy closed syllables. The actual stress is assigned in LA to the penultimate syllable for the active voice but the ultimate one in its passive form (Chapter 3). Alongside the shift of stress, the vowel quality changes. The vowel in the ultimate position is lowered in the passive form, as previously explained. It exhibits the association of stress with vowel height as discussed

[27]The attested categories are the words written in bold: present active and past passive.

Active	1st person		2nd person		3rd person	
k-t-b	Masculine	Feminine	Masculine	Feminine	Masculine	Feminine
Past	ˈktabt	ˈktabt	ˈktabt	ˈktabti	ʔikˈtab/ˈktab	ˈkitbit
Present	***ˈniktib***	ˈniktib	ˈtiktib	ˈtiktibi	ˈyiktib	ˈtiktib
Imperative	---	---	ˈʔiktib	ˈʔiktibi	---	---

Passive	Masculine	Feminine
Past	***nikˈtab***	niˈkitbit
Present	ˈyinkitib	ˈtinkitib

in 4.2 and which can be seen above in Patterns (11) and (12). For that reason and because this sort of alternation is unknown in English, this pattern falls under H 3-3.

As shown in Table 5.16, in the active form, the learners showed uncertainty about their preference and incorrectly assigned stress to the ultimate position in 48.3% of cases. However, in the passive form, the learners correctly favoured the final syllable in 73.3% of cases. Thus, the learners struggled when the penultimate syllable was stressed and performed better when the stress placement was on the ultimate syllable. The learners' performance was different to the previous patterns in which the class of the words was not a verb. In pattern (14) which involved nouns, the learners assigned stress to the penultimate syllable.

Table 5.16: The Learner Production Results for Pattern (16)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std. D	Min	Max
Active Form	Penultimate	15	31	**51.7%**	**Correct**	46.7	0	100.
	Ultimate	15	29	48.3%	Incorrect	46.7	0	100.
Passive Form	Penultimate	15	16	26.7%	Incorrect	42.7	0	100.
	Ultimate	15	44	**73.3%**	**Correct**	42.7	0	100

Based on the Friedman test, there was a nonsignificant result in the active form category (Chi Square = 0.077, p = 0.782) as the learners did not show a clear preference. This can be taken as an indication that this subcategory is not straightforwardly acquired. The difference between the number of the instances allocated to each syllable position in the passive form, however, approaches significance (Chi Square = 3.27, p = 0.071). This is also an indication that the learners are inclined to assign stress to the ultimate syllable.

5.2.3.2 **CVC.cvc/cvc.CVCC (1st and 3rd Person, Past, masculine) Pattern (17)** [28] **/'baddil/-/bad'dilt/, /'fakkir/-/fak'kirt/, /'kassir/-/kas'sirt/**

This pattern covers two sub categories: the past 3rd person form which is composed of two balanced-weight syllables with penultimate stress, and the past 1st person form which is composed of a heavy syllable followed by a superheavy one. This pattern is characterised by the occurrence of geminate consonants at the internal boundaries of the syllables in both sub categories. It is complicated to predict how the learners would perform in this pattern as there is no such structure in English, so H3-3 would predict a transfer. However, predicting the transfer of English stress patterns, one might suggest that the past 3rd person form would receive stress on the penultimate syllable as the final one is excluded, while the past 1st person form would receive stress on the final superheavy syllable (closed by a cluster) because this final syllable is exempted from exclusion, as can be seen in *im'port* (V).

Table 5.17 below shows that the majority of responses placed stress in the ultimate position in both subcategories. In the past 3rd person form, 73.3% of cases incorrectly received stress on the ultimate position. In the past 1st person form, 88.9% of cases correctly received stress on the ultimate syllable. This can possibly be explained, as verbs

[28] CVC.cvc refers to past 3rd person and cvc.CVCC refers to past 1st person. The attested categories are written in bold.

Active	1st person		2nd person		3rd person	
b-d-l	Masculine	Feminine	Masculine	Feminine	Masculine	Feminine
Past	***bad 'dilt***	bad'dilt	bad'dilt	bad'dilti	***'baddil***	'badlit
Present	ʔin'baddil	ʔin'baddil	ti'baddil	ti'baddili	yi'baddil	ti'baddil
Imperative	---	---	'baddil	bad'dili	---	---

Passive	Masculine	Feminine
Past	ti'baddil	tibad'dilt
Present	yit'baddil	tit'baddil

in minimal pairs in English receive final stress so the learners showed a partially negative transfer in their interlanguage.

Table 5.17: The Learner Production Results for Pattern (17)

Mixed Conditioned		N	Responses	Mean %t	Accuracy	Std. D	Min	Max
3rdpeson	Penultimate	15	12	**26.7%**	**Correct**	36.1	0	100.
	Ultimate	15	33	73.3%	Incorrect	36.1	0	100.
1st person	Penultimate	15	5	11.1%	Incorrect	27.2	0	100.
	Ultimate	15	40	**88.9%**	**Correct**	27.2	0	100.

It can be noticed that the learners were decisive about their choices. That is confirmed by further statistical analysis. The results of a Friedman test showed that the learners had clear preference for the ultimate syllable position in both subcategories. In the past 3rd person form, there was a significant result (Chi Square = 5.4, p = 0.020) and the result was highly significant in the past 1st person form (Chi Square = 11.26, p = 0.001). Evidently, the two syllable positions were not treated equally.

5.2.3.3 CVC.cvc/cvc.CVC (Imperative/ 3rd Masc Past) Pattern (18) [29] /ˈ(ʔ)albis/-/(ʔ)ilˈbas/, /ˈ(ʔ)azʕil/-/(ʔ)izˈʕal/, /(ʔ)aftaħ/-/ʔifˈtaħ/, /ˈ(ʔ)amsaħ/-/(ʔ)imˈsaħ/

This pattern is composed of the imperative and past forms. Each subcategory is formed by two heavy closed syllables; the penultimate syllable is the stress bearer in the imperative form while the ultimate one is the syllable that receives stress in the past form.

[29] CVC.cvc refers to the imperative and cvc.CVC refers to the past. The attested categories are written in bold.

Active	1st person		2nd person		3rd person	
l-b-s	Masculine	Feminine	Masculine	Feminine	Masculine	Feminine
Past	ʔilˈbast	ʔilˈbast	ʔilˈbast	ʔilˈbasti	***ʔilˈbas***	ˈlibsit
Present	ˈnalbis	ˈnalbis	ˈtalbis	ˈtalbisi	ˈyalbis	ˈtalbis
Imperative	---	---	***ˈʔalbis***	ˈʔalbisi	---	---

Passive	Masculine	Feminine
Past	litˈbas	iltibsit
Present	ˈyiltibis	ˈtiltibis

This pattern shows a shift in the stress position but it also shows a change in the vowel quality in the penultimate position as is also the case in pattern (16). The vowel is raised in the penultimate syllable when it is not a stress holder and it is lowered in the ultimate syllable when it is a stress holder. H3-3 predicts a negative transfer effect as such patterns do not exist in English.

In fact, Table 5.18 shows that the learners inaccurately assign stress to the ultimate position in 48.3% of cases in the imperative form. The learners' performance is marginally better in the past form, where 56.7% of the responses made by the learners, whichy stressed the ultimate syllable, were accurate.

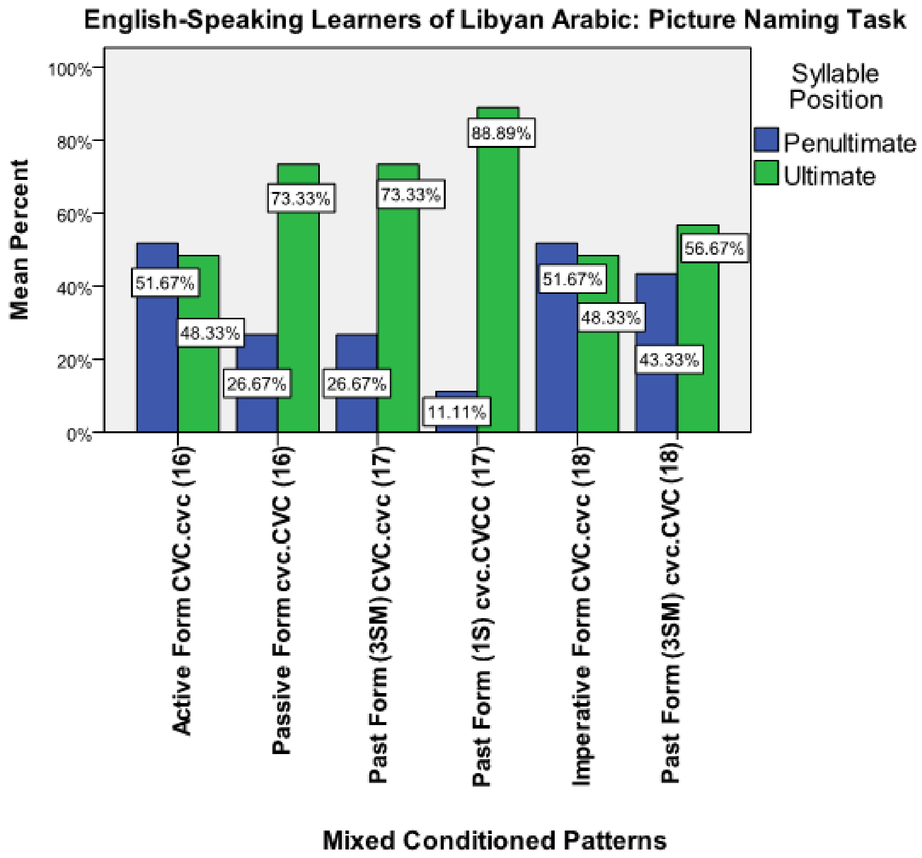
Table 5.18: The Learner Production Results for Pattern (18)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std. D	Min	Max
Imperative Form	Penult	15	31	**51.7%**	**Correct**	44.8	.0	100
	Ultimate	15	29	48.3%	Incorrect	44.8	.0	100
Past Form	Penult	15	26	43.3%	Incorrect	37.2	0	100
	Ultimate	15	34	**56.7%**	**Correct**	37.2	0	100

The result of the Friedman test was nonsignificant for the imperative sub-pattern (Chi Square = 0.07, p = 0.796). This confirms that the learners did not show a clear preference for any syllable position in the imperative form. The result was also nonsignificant (Chi Square = 1.14, p = 0.285) for the past form. So the learners showed widespread variation. This does not confirm H3-3. One might suggest that in this situation, the learner tried out whatever possibilities Universal Grammar suggests/allows and fluctuates between them, until eventually the input provides the right form. This Fluctuation Hypothesis (Ionin et al. 2004) is tested in the acquistion of articles in English by learners whose L1 has no articles. So in this case could we say that, in the absence of anything like this in L1, the learners are trying out different forms?

5.2.3.4 **Summary of Learner Production of Mixed Conditioned Patterns**

Figure 5.3: Mixed Conditioned Stress Patterns of Disyllabic Verb forms



The figure above shows that the learners either showed a preference for the ultimate position, or they showed no preference for any position. To be more precise, when the actual stress is assigned on the penultimate syllable as in the active (16) and imperative (18) forms, the learners had no clear preference. However, when the actual stress is assigned to the ultimate syllable, their performance was more accurate. It can be noticed that, in the past 3rd person form of pattern (17), although the actual stress is on the penultimate syllable, the learners selected the ultimate position more often. It is possible that there is another element involved in this pattern, that ofthe effect of the geminate consonants which push the stress towards the ultimate syllable. This assumption is suggested by the current data as an attempt to analyse the learners' interlanguage. The question that can be raised is why did the learners give up their unmarked position (penultimate syllable)? One might claim that the learners made another generalization that is based on the grammatical category of words. That is, verbs are most likely to receive stress on the final syllable in English in minimal pairs. With regard to regularity, perhaps one can claim that as a result of dissimilar structures in the L1 and L2, and as these forms are slightly unpredictable because they do not follow the syllable weight criterion but rather they are affected by vowel quality (patterns (16) and (18)), the L1 pattern of stressing the ultimate syllable in verbs is transferred to the L2, thereby slightly supporting H3-3.

5.3 Native speakers of LA: Picture Naming Task

This section displays the results of the picture naming task taken by the native speakers of Libyan Arabic. Similar to the previous section, the phonological patterns of Libyan Arabic are analysed first, followed by the mixed conditions patterns. Native Speakers were categorical in choosing the expected correct response for most word patterns. They achieved 100% in the majority of the patterns; the only exceptions were Patterns (3), (11), (14), (17) and (18) which are listed in this section.

5.3.1 Phonologically Conditioned Patterns: Trisyllabic Words

5.3.1.1 **cvc.CVC.cv Pattern (3)**
/mus.'taʃ.fa/, / mux.'til.fa/, /mix.'tim.ra/

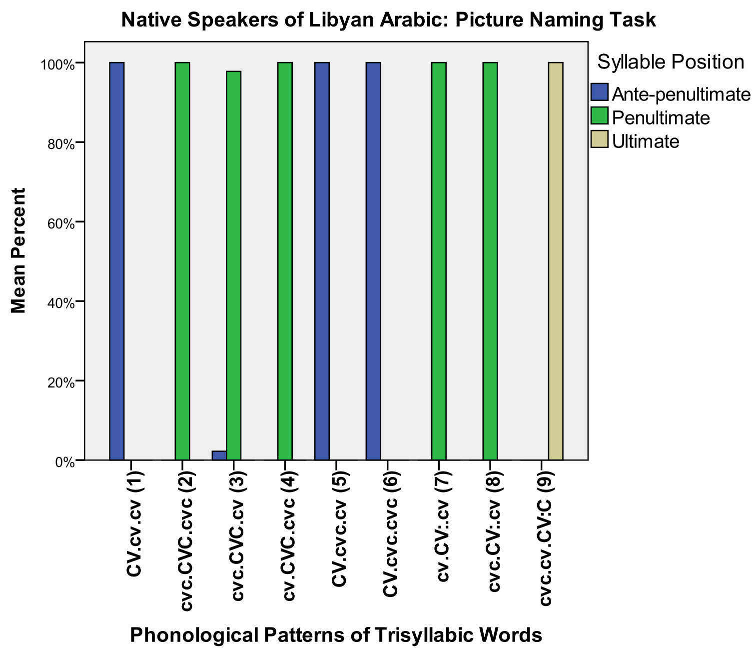
Table 5.19: The Native Speaker Production Results for Pattern (3)

cvc.CVC.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	1	2.2%	Incorrect	8.6	0	33.3
Penultimate	15	44	**97.8%**	**Correct**	8.6	66.7	100.
Ultimate	15	0	.0%	Incorrect	.0	0	.0

Unexpectedly, not all responses made by the native speakers match the correct stress assignment proposed in Chapter 3. So 97.8% of the items correctly received stress on the penultimate syllable. Only one item was an exception to the norm as shown in the table above. The difference is still huge; therefore, there is no need to conduct statistical tests to evaluate the native speakers' performance.

5.3.1.2 **Summary of Native Speaker Results for Trisyllabic Word Production**

Figure 5.4: Phonologically Conditioned Stress Patterns of Trisyllabic Words in Native Speaker Production



The figure above shows that in accordance with the Libyan stress rules claimed by the researcher, the native speakers' performance provided categorical responses. Apart from pattern (3), stress was assigned accurately in all the patterns. Pattern (3) fell behind by one item only. It scored a mean percent of 97.8%. It is considered as a random variation error because the mean error is less than 5%. This performance can be taken as a proof not only for the validity of the theoretical study of Libyan Arabic stress, but it is also indicates that the method which was used to extract the production of the selected items was successful. It should be remembered that both the learners and the native speakers were exposed to the same methodology, using the same pictures and following the same instructions and procedures.

5.3.2 Phonologically Conditioned Patterns: Disyllabic Words

5.3.2.1 **CV.cvc Pattern (11)**
/muriʃ/, /'ruʃin/, /ħabil/

Table 5.20: The Native Speaker Production Results for Pattern (11)

CV.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	42	**93.3%**	**Correct**	18.7	33.3	100
Ultimate	15	3	6.7%	Incorrect	18.7	.0	66.7

A few items in this pattern were inaccurately produced, with stress being assigned to the ultimate syllable. This cannot be considered to be random variation as the mean percentage of stress on the ultimate syllable is 6.7% which exceeds the maximum average 5% that can be considered as such. Thus there could be a reason behind this deviation. However, apart from these three items, the majority of the responses followed the expected LA stress placement as shown above.

5.3.2.2 **CVC.cvc Pattern (14)**
/'filfil/, /'maktib/, /'maxzin/, /'mafriʃ/

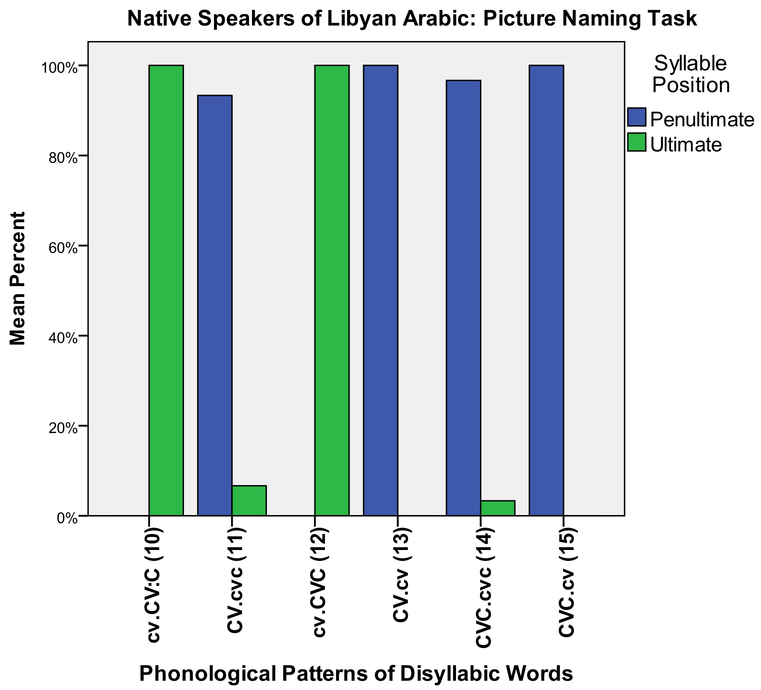
Table 5.21: The Native Speaker Production Results for Pattern (14)

CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	58	**96.7%**	**Correct**	8.8	75.0	100.
Ultimate	15	2	3.3%	Incorrect	8.8	0	25.

Not all of the items received stress on the penultimate syllable. The native speakers correctly assigned stress on the penultimate syllable in 96.7% of cases, with the exception of two items.

5.3.2.3 **Summary of Native Speakers Results for Disyllabic Word Production**

Figure 5.5: Phonologically Conditioned Stress Patterns of Disyllabic Words in Native Speaker Production



The figure above shows that the native speakers conform to the researcher's view of Libyan Arabic stress patterns with no overt divergence. The natives achieved the highest level in patterns (10) and (12) where the actual stress holder is the final syllable and also in patterns (13) and (15) where the ultimate syllable is light. However, there was a very minimal decline in performance of the native speakers in patterns (11) and (14), where the ultimate syllable was a closed syllable CVC but it was not the actual stress holder.

5.3.3 Mixed Conditioned Patterns: Disyllabic Verbs

5.3.3.1 **CVC.cvc/cvc.CVCC (1st and 3rd Person, Past, masculine) Pattern (17) /'baddil/-/bad'dilt/, /'fakkir/-/fak'kirt/, /'kassir/-/kas'sirt/**

Table 5.22: The Native Speaker Production Results forPattern (17)

Mixed Conditioned		N	Responses	Mean	Accuracy	Std. D	Min	Max
Past 3rd person	Penultimate	15	42	**93.3%**	**Correct**	25.8	.0	100
	Ultimate	15	3	6.7%	Incorrect	25.8	.0	100
Past 1st person	Penultimate	15	0	.0%	Incorrect	.0	.0	0
	Ultimate	15	45	**100%**	**Correct**	.0	100	100

Unpredictably, the native speakers produced a few items with incorrect stress assignment in the past 3rd person form. 93.3% of instances were accurately allocated to the penultimate syllable and 6.7% of cases were produced with ultimate stress. However, the native speakers reached 100% accuracy in the past 1st person form when all items were produced with ultimate stress in this subcategory, as can be seen above.

5.3.3.2 **CVC.cvc/cvc.CVC (Imperative/ 3rd Masc Past) Pattern (18)**
/'(ʔ)albis/-/(ʔ)il'bas/, /'(ʔ)azʕil/-/(ʔ)iz'ʕal/, /(ʔ)aftaħ/-/ʔif'taħ/, /'(ʔ)amsaħ/-/(ʔ)im'saħ/

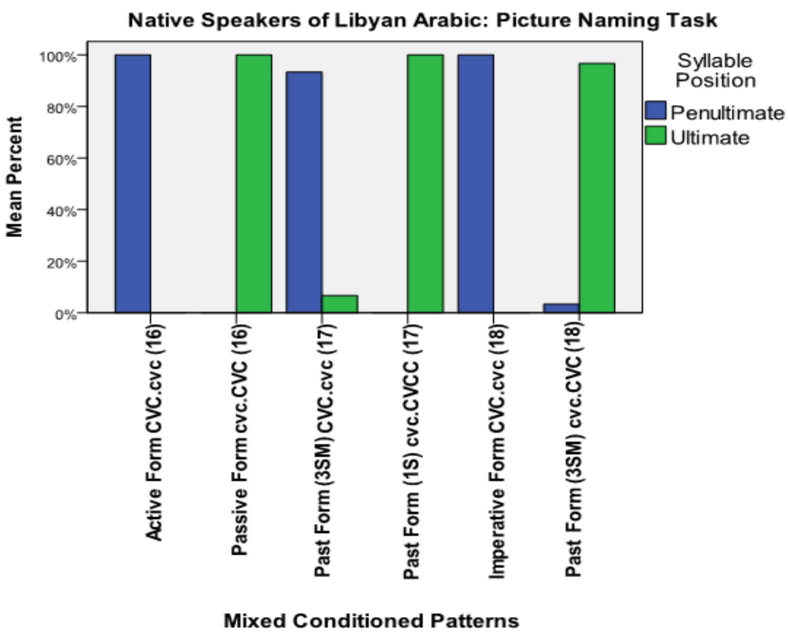
Table 5.23: The Native Speaker Production Results for Pattern (18)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std. D	Min	Max
Imperative Form	Penultimate	15	60	100%	**Correct**	0	100.	100.
	Ultimate	15	0	0%	Incorrect	0	.0	.0
Past Form	Penultimate	15	2	3.3%	Incorrect	12.9	.0	50.
	Ultimate	15	58	96.7%	**Correct**	12.9	50.	100.

Similar to the previous pattern, the native speakers missed a few items in the past form; therefore, they did not reach the ceiling. 96.7% of cases received stress on the ultimate syllable and only 3.3% of cases departed from the pattern. The native speakers showed consistency in the subcategory, the imperative form, with all the items being produced with stress on the penultimate syllable as shown in the table above.

5.3.3.3 **Summary of Native Speakers Production of Mixed Conditioned Patterns**

Figure 5.6: Mixed Conditioned Stress Patterns of Disyllabic Verb forms



The figure shows that the native speakers performed in agreement with Libyan Arabic stress system. A minimal difference can be observed in one subcategory of pattern (17), the past 3rd person form. And it can also be noticed in the subcategory of pattern (18), the past form. Absolute consistency in the production of the native speakers in pattern (16) can be seen, with a ceiling effect in both subcategories.

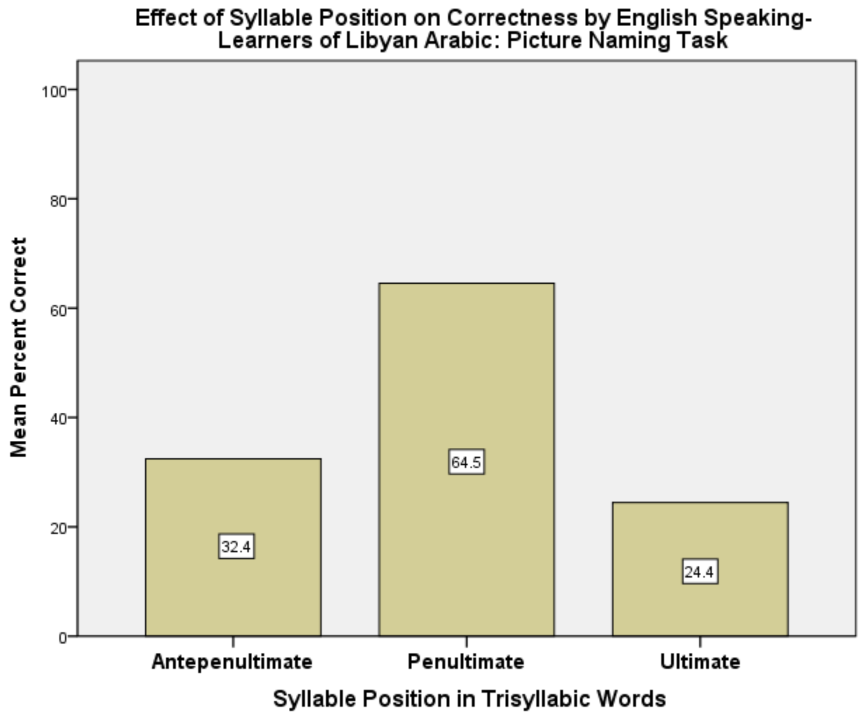
5.4 The Effect of Syllable Structure on Accuracy in Stress Production

In this section, the goal is to display the learner results from a different perspective, by investigating the effect of various aspects on correctness of response: the effect of syllable position and the effect of vowel length of the target stressed syllable versus closure of the target stressed syllable on correctness.

5.4.1 The Effect of Syllable Position on Accuracy of Learner Production in Trisyllabic Words

A detailed investigation into the accuracy of stress assignment showed that accuracy was highest when the target landing site was the penultimate syllable, followed by the antepenultimate and the ultimate syllables. The overall difference in the accuracy between the three types of positions was significant (Wald Chi Square = 10.105, p = 0.006). However, pair-wise comparisons showed that the difference in accuracy between words stressed on the antepenultimate and the ultimate syllables was not significant (Wald Chi Square = 0.293, p = 0.588, Bonferroni adjusted p = 1). Words stressed on the penultimate syllable, however, were responded to significantly more accurately than words stressed on the antepenultimate one (Wald Chi Square = 6.449, p = 0.011, Bonferroni adjusted p = 0.033) and then words stressed on the ultimate syllable (Wald Chi Square = 9.331, p = 0.002, Bonferroni adjusted p = 0.006). This means that words with penultimate stress in Libyan Arabic were produced more accurately by the learners, but words with ultimate or antepenultimate stress were produced less accurately by the learners. The difference in accuracy between words with antepenultimate and words with penultimate stress was quite substantial, as accuracy on the latter was about twice of that on the former (Figure 5.7).

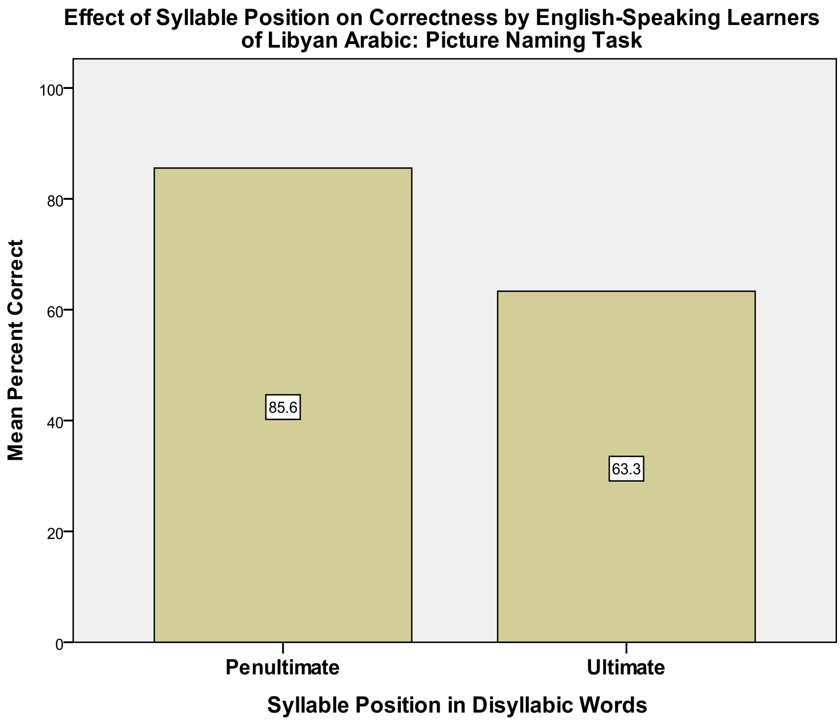
Figure 5.7: The Effect of Syllable Position on Accuracy of Stress Production in Trisyllabic Words by Learners



5.4.2 Syllable Position on Accuracy of Learner Production in Disyllabic Words

Descriptively, words with stress on the penultimate syllable in disyllabic words in Libyan Arabic were responded to correctly more often than those with ultimate stress. This was similar to the responses in trisyllabic words, where words with penultimate stress were produced more accurately than the others. However, the difference in accuracy between words with penultimate and words with ultimate stress in disyllabic words was not quite significant as it slightly exceeded 0.05 (Wald Chi Square = 3.254, p = 0.071). Still, the penultimate syllable was the preferred position for stress in the L2 production of the learners (Figure 5.8).

Figure 5.8: The Effect of Syllable Position on Accuracy of Stress Production in Disyllabic Words by Learners



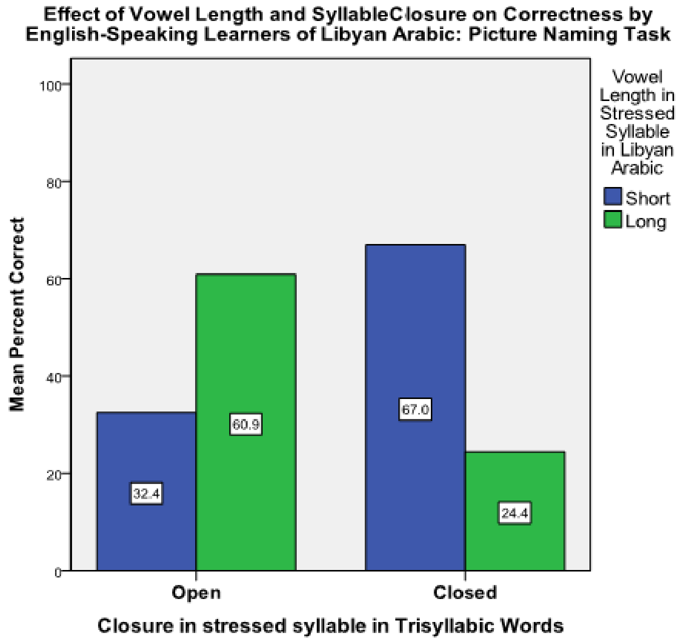
5.4.3 Vowel Length versus Syllable Closure on Accuracy of Learner Production in Trisyllabic Words

The interaction between vowel length and syllable closure, which together create syllable weight, affected the accuracy of the words produced by the learners. Figure 5.9 shows that if the target stressed vowel was long and open, or short and closed in Libyan Arabic, the mean percentage of correct responses would be higher than 60%. That is where the target form is a CV: structure or a CVC structure. However, the opposite combination resulted in far lower accuracy levels, when a target stressed vowel that is short and open or long and closed was involved. That can be found in CV and CV:C structures. The length of vowel and closure of the syllable did not themselves affect the accuracy of the production, but the interaction between these two aspects forming certain combinations greatly improved the number of correct responses. The finding was supported by the results of the Generalized Linear Model statistical tests that were conducted to examine the effect of vowel length by syllable closure. The effect was not significant for vowel length alone (Wald Chi Square = 0.593, p = 0.441) or syllable closure alone (Wald Chi Square = 0.014, p = 0.906). On the other hand, there was a highly significant interaction for the combination of length by closure (Wald Chi Square = 9.297, p = 0.002). Thus, as demonstrated in Table 5.24, the order CVC> CV:> CV> CV:C summarises the ranking for accuracy of the learner's performance. Learners were most accurate when the target stressed syllable was CVC and least accurate when the target stressed syllable was CV:C, i.e. superheavy.

Table 5.24: Accuracy Ranking of Syllable Structures in Learner Production of Trisyllabic Words

CVC>	CV:>	CV>	CV:C
67%	60.9%	32.4%	24.4%

Figure 5.9: The Effect of Vowel Length versus Syllable Closure on Accuracy of Stress Production in Trisyllabic Words by Learners



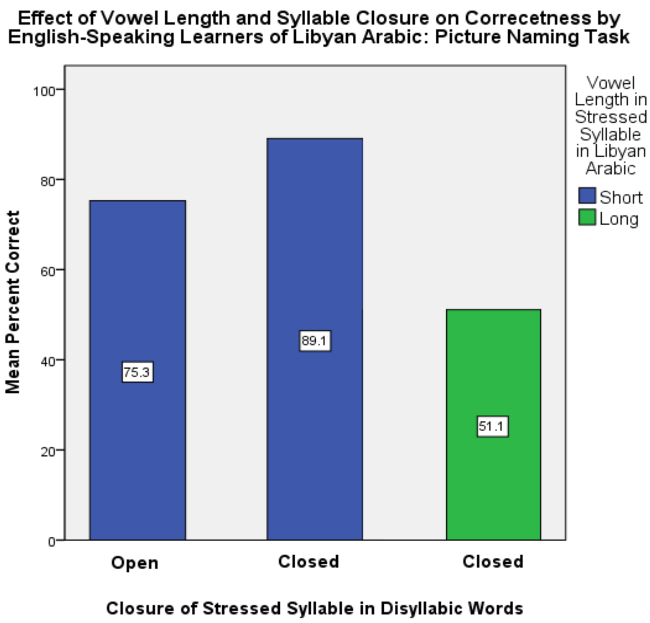
5.4.4 Vowel Length and Syllable Closure on Accuracy of Learner Production in Disyllabic Words

The scenario here is different to trisyllabic words, where the combination of the long open and short close vowels affected response accuracy. In the current category, vowel length showed a significant effect on response accuracy (Wald Chi Square = 16.67, $p < 0.001$) and there was a marginally significant effect of syllable closure (Wald Chi Square = 3.656, $p = 0.056$). The interaction was not calculated as there were no disyllabic word patterns with stressed long open vowels included in the study. However, the combination of a closed syllable with a short vowel or closed syllable with a long vowel was available. It can be noticed that the short vowel in a CVC syllable was responded to more accurately than the long vowel in a CV:C structure. The ranking of syllable structure based on accuracy in disyllabic words is shown in Table 5.25. The learners were least correct when the superheavy syllable was the target stress landing site, while they were most accurate when the stressed heavy close syllable was the target, parallel with Table 5.24 for trisyllabic patterns.

Table 5.25: Accuracy Ranking of Syllable Structures in Learner Production of Disyllabic Words

CVC>	CV>	CV:C
89.1%	75.3%	51.1%

Figure 5.10: The Effect of Vowel Length and Syllable Closure on Accuracy of Stress Production in Disyllabic Words by Learners



5.4.5 Syllable Position and Vowel Height on Accuracy of Learner Production in Mixed Conditioned Patterns

In this section, I will look at the effect of syllable position in the mixed conditioned patterns and I will attempt to examine whether or not there is an interaction between vowel quality and syllable position in these patterns.

The learners were more accurate when the actual stress is on the ultimate syllable, with an accuracy rate of 70.9% in this category regardless of other factors, as shown in Figure 5.11 below. The learners were also more accurate when the stressed vowel was a high vowel with an accuracy rate of 51.7% in the penultimate and 88.9% in the ultimate position as shown in Figure 5.12 below. However, no interaction between vowel quality and syllable position was found in the performance of the learners. Learners generally preferred to stress the ultimate syllable in the mixed conditioned patterns.

Figure 5.11: The Effect of Syllable Position on Accuracy of Stress Production in Mixed Conditioned Patterns by Learners

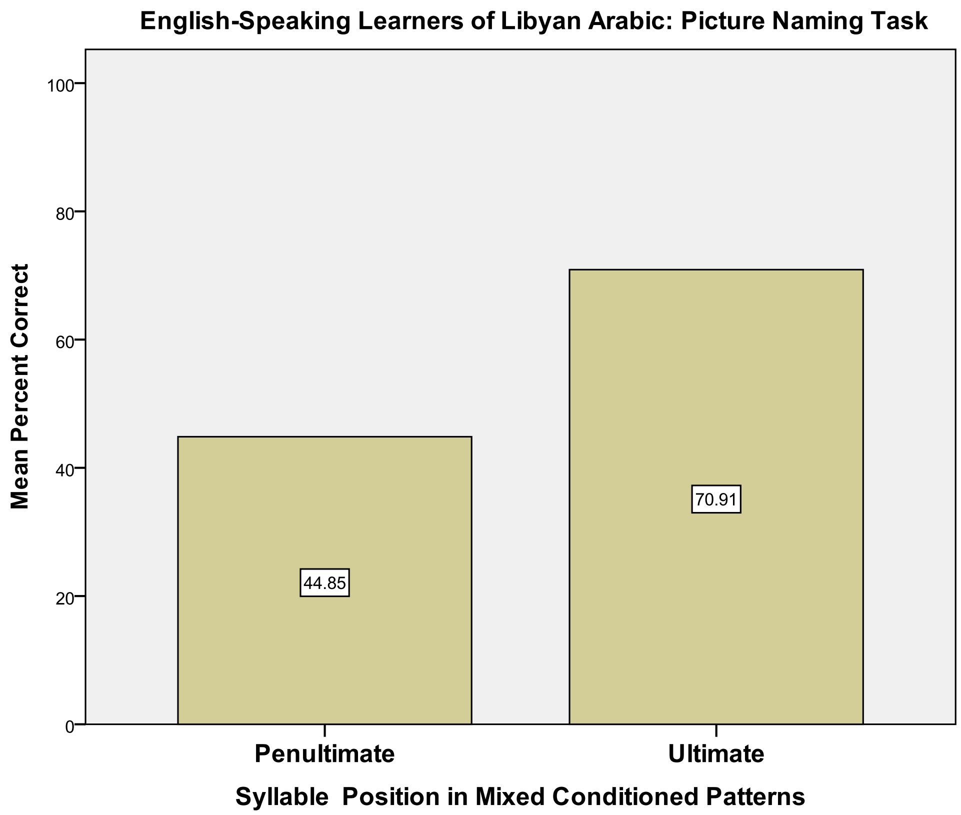
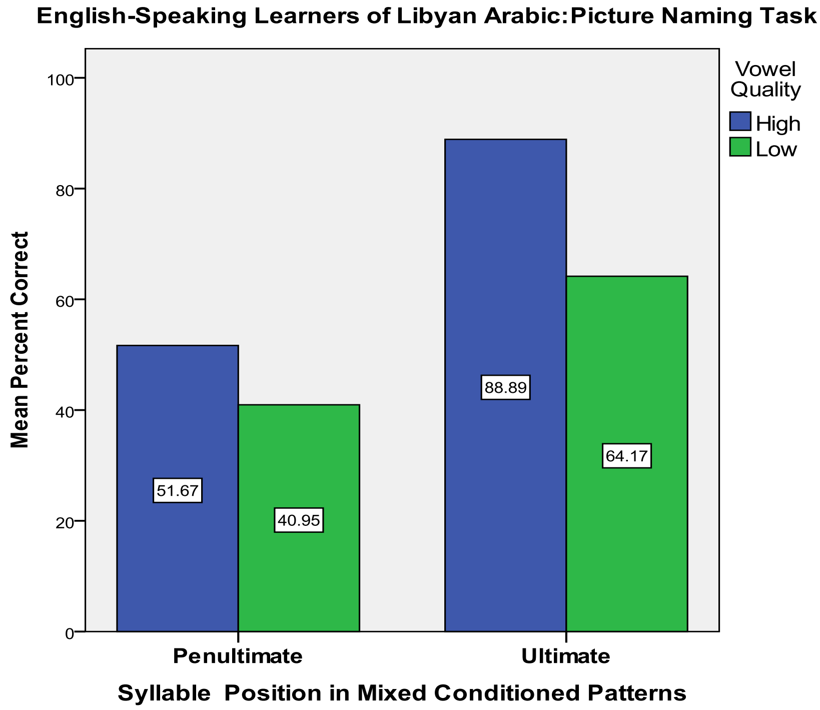


Figure 5.12: The Effect of Syllable Position versus Vowel Quality on Accuracy of Stress Production in Mixed Conditioned Patterns by Learner



5.5 Syllable Position, Vowel Length, Vowel Height and Syllable Closure on Accuracy of Native Speakers in Stress Production

As mentioned earlier, native speakers showed a categorical response in choosing the expected stress assignment for most word patterns. They achieved 100% in the majority of the patterns; therefore, syllable position has no effect on the native speakers' accuracy of production because the majority (if not all) of words were correctly produced, regardless of the position of the stressed syllable and no interaction effect was found between vowel length and syllable closure or between syllable position and vowel height on accuracy (figures can be found in Appendix 6).

5.6 Conclusion

In this chapter, I have presented the results obtained from the production task performed by both the native speakers and L2 learners of LA.

The results show that the native speakers, with a few exceptions probably due to performance lapses, produce the stress patterns assumed by researchers to be correct/grammatical in LA. However, what makes this study different is the empirical evidence obtained from their performance, as this study is not solely based on researcher intuition, and proved empirically that there were indeed very few occasions where the native speakers deviated from the researcher's predicted patterns (these could be down to performance errors or concentration lapses). However, there was no effect of syllable position, closure, and vowel length or vowel height and there were no interaction effects of these variables on accuracy by the native speakers.

The results also show that the learners achieved high accuracy rates when the stress patterns are predictable and L1 and L2 match H3-1. The learners found it difficult to assign stress in unpredictable patterns that do not obey the quantity sensitive condition (i.e. patterns (5), (6) and (11)). It seems that the learners also made a generalisation about stressing the heavy syllable CVC; they were sensitive to the weight and consequently the syllable structure. There is no evidence available to assess if this is because of the effect of their L1, as both languages are quantity sensitive. The errors which were made in the mixed conditioned patterns can be attributed to L1 transfer, because the learners showed a preference for stressing the final syllable in verbs but they preferred to stress the penultimate syllables in nouns, even when there were similar syllable structure patterns. Bear in mind that the target language does not promote this distinction. Other errors made by the learners can be attributed to the quality and quantity of the vowels. This could be because vowel quantity in Arabic is a repetition of the same quality of the short vowel which makes it difficult to recognise, but in English the difference in quantity is accompanied by a difference in quality. Another element is that vowels in Libyan Arabic are not reduced if they are not stressed, as in English.

In the last sections, it has been found that syllable position has an effect on stress assignment with the syllable structure. The learners were most accurate when the targeted stress syllable was the penultimate one, while they were least accurate when the targeted stress syllable was the ultimate one. The table below summarises which targeted stressed structure the participants were most accurate on. The CVC was at the top and CV:C was at the bottom. The learners' accuracy was at the lowest rate when the actual stress bearer was a CV:C structure.

Table 5.26: Summary of Correctness Based Syllable Position and Syllable Structure

Learners	Picture Naming			
Syllable Position	Penultimate>	Antepenultimate>		Ultimate
Syllable Structure	CVC>	CV:>	CV>	>CV:C

In the next chapter, I will present an account of the participants' performance using an optimality theoretic analysis, trying to compare both groups and formulating a ranking that covers their stress patterns and describe the nature of the stress system that learners have during their interlanguage.

6 Chapter Six: Discussion of Production

6.1 Introduction

Having introduced the statistical results of the participants' production, I will now provide an analysis and discussion of the results presented in the previous chapter. This aim will be achieved by identifying the constraint ranking of the learners' interlanguage and comparing it with the ranking of the native speakers. Similar to the previous chapter, the analysis will be provided per pattern for the trisyllabic words and disyllabic words followed by the mixed conditioned patterns of disyllabic verbs adopting an optimality theoretic approach.

6.2 Phonologically Conditioned Patterns of Trisyllabic Words

6.2.1 CV.cv.cv Pattern (1)

This pattern is similarly found in words like *ˈpolicy* /ˈpɒ.lə.si/ and *ˈfamily* /ˈfæ.mə.li/ in English where the light antepenultimate syllable is the stressed one. If we compare these two words with *saˈvannah* /səˈvæ.nə/, we can see that reduced vowels do not receive stress; the attested words do not include reduced vowels which might be a reason behind the learners missing the correct stress location, but this cannot be confirmed in this study as further phonetic investigation is needed. Zuraiq (2005, p. 33, p. 62) found that native Arabic speakers do not use vowel reduction as a cue for stress in unstressed syllables in Arabic and in the same study, native speakers of Arabic show less reduction in the production of unstressed syllables in English compared to native speakers of English in his study. Recalling the results of the learners, the majority of instances were correctly stressed on the antepenultimate syllable H3-1. However, there were some instances which incorrectly received stress on the penultimate syllable (see 5.2.1.1). However, the variation of assigning stress on the antepenultimate or penultimate syllable is found within the group of the learners but rarely with the individual from the group - this will be shown in section 6.2.2.

We will develop the constraints that are needed for the native speakers and after that evaluate them against the learners' constraints. To derive the correct assignment of stress for the CV.cv.cv pattern, the final syllable is excluded from the stress computation and this gives rise to including the NON-FINALITY σ constraint which forces the elimination of the last syllable. The type of foot is trochaic as the antepenultimate syllable is the actual stressed syllable. Degenerate feet are not permitted, which means that the FOOT BINARITY constraint is a must to derive the correct stress assignment in both the L1 and L2. So these three constraints are employed to derive the stress assignment onto the antepenultimate syllable in CV.cv.cv structures -L1 matches L2 as can be seen in the tableau below (discussed in Chapter 3).

Tableau 6.1: Native Speakers of Libyan Arabic

/ʃarika/	FT-BIN	TROCH	NON-FIN σ
→a. ('ʃari)<ka>[30]			
→b. ('ʃari) ka			
c. ('ʃa) rika	*!		
d. (ʃa'ri)<ka>		*!	
e. ʃa('rika)			*!

[30] < > indicates that the syllable is excluded. ( ) is for building the metrical foot.

However, candidate (a) and (b) are both optimal outputs. Therefore, PARSE σ constraint (see section 1.3.2 for constraint requirement) is added to the ranking to derive candidate (a) as the optimal one. If we accept that the constraint ranking adopted by the learners to derive the correct stress assignment follows their L1 or L2, then this ranking applies to 57% of the instances produced by the learners who assign stress correctly.

Tableau 6.2: Native Speakers of Libyan Arabic

ʃari ka	FT BIN	TROCH	NON-FIN σ	PARSE σ
✓a. ('ʃari)<ka>				
b. ('ʃari) ka				*!
c. ('ʃa) rika	*!			**
d. (ʃa'ri)<ka>		*!		
e. ʃa('rika)			*!	

Some instances were produced with penultimate stress by the learners accompanied by a change to the identity of the stressed vowel. Given this, it means that the identity of the input (native speakes' production) and the output (learners' production) are not identical in terms of the structure and consequently affected the stress position. The vowel of the penultimate syllable is lengthened; therefore, the constraint DEP μ will be introduced below to control the addition of mora which results in changing the identity of the vowel.

Tableau 6.3: Learners

ʃari ka	FT BIN	TROCH	NON-FIN σ	PARSE σ	DEP μ
a. ʃa('riː)<ka>				*!	*
→b. ('ʃari)<ka>					
c. ('ʃari) ka				*!	
d. ('ʃa) rika	*!				
e. (ʃa'ri)<ka>		*!			
f. ʃa('rika)			*!		

The candidate which satisfies all constrains is candidate (b); this candidate is not the incorrect output produced by the learners. So, SWP constraint will be introduced to the ranking to eliminate stress on light syllables, regardless of fulfilling the requirement of the FOOT-BINARITY. Recalling the results (Chapter 5), the learners showed a preference for assigning stress to bimoraic syllables (i.e. the combination of long open and closed short) regardless of foot construction. Candidates which receive stress on superheavy or light syllables are not optimal in the learners' grammar. This gives legitimacy to the SWP to be ranked after PARSE σ. SWP was introduced by de Lacy (2002) and McCarthy (2008), emerging from the Stress to Weight Principle so a light stressed syllable incurs a violation, but for the purpose of this study SWP constraint has to be applied regardless of the foot construction. So candidate (b) violates SWP constraint but it does not rule it out.

Tableau 6.4: Learners (correct production)

/ʃarika/	FT-BIN	TROCH	NON-FIN σ	PARSE σ	SWP	DEP μ
a. ʃa('riː)<ka>				*		*
→b. ('ʃari)<ka>					*	
c. ('ʃari) ka				*	*!	
d. ('ʃa) rika	*!			**	*	
e. (ʃa'ri)<ka>		*			*!	
f. ʃa('rika)			*	*	*!	

The actual production by some learners is still not the optimal. So this ranking does not fully represent the learners' interlanguage. According to the regular stress pattern of the L1 and L2, the Right End Rule is active, which requires the RIGHTMOST constraint to be introduced to push stressed syllables towards the right. So in the table below candidate (b) incurs two violations, as the third syllable from the right is stressed. Candidate (a) is the optimal as it violates the RIGHTMOST once.

Tableau 6.5: Learners (Inaccurate Production)

/ʃarika/	R-MOST	PARSE σ	SWP	DEP μ
✓a. ʃa('riː)<ka>	*	*		*
b. ' (ʃari)<ka>	**!		*	

Tableau 6.6 displays the correct production of the learners and the production of the native speakers. DEP μ is demoted in the learner's interlanguage but it is higher ranked in the native speaker's grammar. The SWP is low ranked to allow the light syllable to be stressed if it is a constituent of a bimoraic foot.

Tableau 6.6: Native Speakers

ʃari ka	DEP μ	RIGHTMOST	PARSE σ	SWP
a. ʃa('riː)<ka>	*!	*	*	
✓b. ('ʃari)<ka>		**		*

To recap, the learners stressed both the antepenultimate and penultimate syllables in the CV.CV.CV pattern. So it is not clear whether this performance is derived from the L1 or L2, from the fact that the penultimate syllable is a default position (H2), from the fact that both the antepenultimate and the penultimate syllables are stressable in English and Arabic or from the lack of reduction of vowels in the learners' input.

Cross linguistically, the penultimate syllable is considered as a default position and the site for unmarked stress placement in a number of languages; this is supported by researchers as Roca (1999) Romance languages, Face (2002) Spanish, Wiese (2000) German, Ghini (2001) Italian if it is heavy. However, Clopper (2002) found that statistically the most regular location of stress in English lexical words is the penultimate or the antepenultimate syllables while the ultimate or pre-antepenultimate syllables are least frequent. Perhaps this was transferred to the learners' interlanguage in pattern (1) and also in pattern (7). Therefore, the next pattern that will be examined is pattern (7) as the learners showed similar preference in these two patterns.

6.2.2 cv.CVː.cv Pattern (7)

This structure is available in English in words as *sa'vannah.* The penultimate syllable is the stress bearer. A few researchers claim that the penultimate syllable attracts stress because of its vowel quantity, as the penultimate syllable is biomoraic (Rice, 1996, p 165). English is a quantity sensitive language and consequently the heavy penultimate syllable will attract stress. Others claim that occasionally it is not a biomoraic syllable and in this case it is either a case of iambic stress or marked as lexical stress (Hammond 1999, Duanmu *etal.* 2005). In Libyan Arabic, researchers agreed that the penultimate syllable receives stress in words like /ʃi'baːni/ because of the quantity of the vowel that triggers the stress (Al-Ageli 1995, Abumdas 1985). Based on H3-1, the production of this pattern should be acquired straightforwardly with no complications.

In fact, the majority of instances were accurately produced but some of the instances were inaccurately produced with antepenultimate stress (section 5.2.1.7). The learners preserved the length of the vowel when correctly stressing the penultimate syllable, but the learners altered the identity of the vowel of the penultimate syllable when stressing the antepenultimate. The vowel is shortened in the penultimate syllable giving rise to a CV.cv.cv structure. Therefore, MAX μ constraint is introduced with DEP μ to control candidates that either lose or gain a mora. However, the ranking below cannot solve this mystery as it rules out candidate (b).

Tableau 6.7: Learners

ru'zaːtˤa	R-MOST	PARSE σ	SWP	DEP μ	MAX μ
✓a. ru'(zaː) <ta>	*	*			
b. ('ruza)<ta>	**!		*		*

It looks as if some learners show variation and inconsistency in producing CV.cv.cv and cv.CVː.cv structures. Broselow (2009, p. 195) states that it is expected that learners will not show the same ranking based on proficiency or personal choice. An in-depth analysis is needed to verify the reasons behind this variation. Is it items-related variation or individual-related variation? I will narrow the discussion and look at the performance of the individuals. The table below compares the number of instances produced per participant per syllable position for pattern (1) and (7).

Table 6.1 Variation among Individuals in Patterns (1) and (7)[31]

Participants	Pattern (1) CV.cv.cv			Pattern (7) cv.CV:.cv		
	Ante	Pen	Ultimate	Ante	Pen	Ultimate
1�	1	2	_	_	3	_
2	_	3	_	_	3	_
3	_	3	_	_	3	_
4�	2	_	1	2		1
5	_	3	_	_	3	_
6✓	3	_	_	_	3	_
7✓	3	_	_	_	3	_
8�	2	1	_	_	3	_
9	3	_	_	3	_	_
10	_	3	_	_	3	_
11	3	_	_	3	_	_
12	3	_	_	3	_	_
13✓	3	_	_	_	3	_
14	3	_	_	3	_	_
15	_	3	_	_	3	_

✓Native-like Production � Undecided

Antepenultimate Penultimate

[31] This table displays the individual performance of the participants. The first column includes participants (par); subsequent columns include syllable positions for the specified patterns. The digits in the cells refer to the number of the items produced by specific participant at certain position. A stands for Antepenultimate, B stands for Penultimate and U stands for ultimate.

It can be noticed that participants 2, 3, 5, 10, and 15 were consistent in producing items with penultimate stress from pattern (1) and (7) while participants 9, 11, 12, and 14 were consistent in producing items with antepenultimate stress. This implies that the learners made a generalisation about what syllable should be stressed in a sequence of open syllables. Other researchers also found that English-speaking learners tend to follow a generalised strategy in assigning stress in L2 (Bullack and Lord 2003, Face 2005 in learning Spanish, Taylor, 2011(a); 2011(b) in learning Japanese).

It seems that participants who showed a tendency for stressing the antepenultimate syllable had the ALIGN LEFT constraint active in their inter-grammar whereas ALIGN LEFT was inactive in the interlanguage of participants that showed a preference for stressing the penultimate syllable. This means that the ranking of RIGHTMOST >PARSE σ > SWP > DEP μ> MAX μ alone is insufficient and cannot derive the production of the antepenultimate stress by some of the learners. At this stage, the ALIGN LEFT constraint has to outrank RIGHTMOST to guarantee the success of CV.cv.cv structure as can be seen in Tableau 6.8. However, this ranking will successfully account for items produced with antepenultimate syllables in patterns (1) and (7) but not for the natives speakers or for the learners who produced penultimate stress; therefore, the constraint ALIGN LEFT will be low ranked in Tableau 6.9 to account for participants who showed a regularity in stressing the penultimate syllable.

Tableau 6.8: Learners Assign Stress on the Antepenultimate Syllable

A. /ru'za:tˤa/	ALIGN- L	R-MOST	PARSE σ	SWP	DEP μ	MAX μ
a. ru'(za:) <ta>	*!	*	*			
✓b.('ruza)<ta>		**		*		*
B../'ʃarika/	ALIGN- L	R-MOST	PARSE σ	SWP	DEP μ	MAX μ
a. ʃa('ri:)<ka>	*!	*	*		*	
✓b. ('ʃari)<ka>		**		*		

Tableau 6.9: Learners Assign Stress on the Penultimate Syllable

A. /ru'za:tˤa/	R-MOST	PARSE σ	SWP	DEP μ	MAX μ	ALIGN-L
✓a.ru'(za:)<ta>	*	*				*
b.('ruza)<ta>	**!		*		*	
B./'ʃarika/	R-MOST	PARSE σ	SWP	DEP μ	MAX μ	ALIGN-L
✓a.ʃa('ri:)<ka>	*	*		*		*
b. ('ʃari)<ka>	**!		*			

In the native production, ALIGN LEFT is ranked lower as it is presumably not active and the faithfulness constraints are highly ranked to eliminate pronunciations which are different from the input of the target language. So the MAX μ constraint rules out candidate (b) in Tableau 6.10 A and DEP μ constraint rules out candidate (a) in Tableau 6.10 B giving the actual outputs in Libyan Arabic.

Tableau 6.10 (A&B): Native Speakers

A. /ru'za:tˤa/	DEP μ	MAX μ	R-MOST	PARSE σ	SWP	ALIGN-L
✓ a.ru'(za:)<ta>			*	*		*
b.('ruza)<ta>		*!	**		*	
B. 'ʃari ka	DEP μ	MAX μ	R-MOST	PARSE σ	SWP	ALIGN-L
a. ʃa('ri:)<ka>	*!		*	*		*
✓b. ('ʃari)<ka>			**		*	

This variation occurs across patterns within the group but rarely with the individual from the group; moreover, it is noticed that this variation happens on two occasions: if the patterns includes all open or close syllables, or when it includes a superheavy final syllable.

Both languages stipulate that stress is assigned towards the right edge with some exceptions; therefore, the RIGHTMOST constraint should outrank NON-FINALITY σ to generally push the stress towards the non-final right syllable.

6.2.3 cvc.CVC.cvc Pattern (2)

This pattern is also available in English in words such as *fan'tastic* and *con'sensus* where the penultimate syllable bears the stress. When this sequence occurs in English, the antepenultimate syllable most often carries stress. Why would the learners get them incorrect? Statistical facts show that, in 2,074 words with three syllables 'σσσ, the antepenultimate syllable receives stress in 1,027, the penultimate syllable receives stress in 859 and only 188 tokens receive final stress (Hammond 1999). Although these facts reflect the frequency of stressed syllables in trisyllabic words, it is relatively difficult to link these facts to the learner's choices as the structure of the syllables might vary and these statistics include any three syllabic words, regardless of their syllable structures. Duanmu, *et. al.* (2005) provide data, taken from the CELEX lexical corpus, for 52,000 English words but with specified weight patterns. A sequence of HHH receives antepenultimate stress in 33% of the words and penultimate stress in 54% of the words. The problem is that a sequence of HHH does not reflect the sequence of three closed syllables, as it is stated that the last syllable will be considered as H if it only contains a tense (long) vowel and also a sequence of HHL cannot reflect the sequence of three closed syllables as the final one might be an open syllable.

Furthermore, Eckler (2005, p.312) mentions that all the possible 125 words in English, found in Webster Dictionary, consist of CVC.CVC.CVC but most of the words are syllabified in a different way so instead of CVC.CVC.CVC, they become CVC.CV.CCVC such as *magnetron* /'mag.nɪ,trɒn/, *centigram* /ˈsen.tɪ.græm/ and actually the majority of the words are orthographically represented by nine letters but phonetically they are smaller and constitute a completely different pattern such as in *manhattan* /mæn.ˈhæ.tən/. Therefore, I would assume that a very small number of words in English exhibit this pattern; some receive stress on the antepenultimate syllable as seen in '*badminton* and some receive stress on the penultimate syllable as seen in *hob*'*goblin.* This would leave the learners with uncertainty if they did not fully learn the L2 stress patterns along with their syllabification. Therefore, a number of learners simplified the structure by inserting a vowel and creating four syllables, or by modifying the syllabification. This may imply that this structure is marked or complicated so CVC.cv.cv.cv or CVC.cv.cvc structures were formed instead. So the word /mid'zawwiʒ/ *married* becomes /'mid.za.wa.ʒi/ and /'mid.za.wiʒ/, respectively.

In the current study, the instances which were produced with ultimate and pre-antepenultimate stress are in the minority and can be considered as random variation. As shown in the previous chapter, the difference between the ultimate and pre-antepenultimate syllables and the antepenultimate and penultimate syllables was significant, which means that the learners were not in favour of the pre-antepenultimate or the ultimate syllables but the difference between the antepenultimate and penultimate syllables was insignificant, which means the grammar of learners comprehends these two positions. Therefore, it is essential to explain the performance of the learners who produced penultimate or antepenultimate stress. Looking at the performance of the individuals in the table below shows that few participants showed accurate stress assignment, but some learners leaned towards left-side syllables stressing the antepenultimate and occasionally the made-up pre-antepenultimate syllable as mentioned earlier in words like /'mid.za.wa.ʒi/ *married* with a made up antepenultimate syllable and in /'mid.za.wiʒ/ *married* where the antepenultimate syllable receives stress.

Table 6.2 Variation among individuals in pattern (2)

Participants	cvc.CVC.cvc Pattern 2			
	Pre-ante	Antepenult	Penult	Ultimate
1			4	1
2√			5	
3�		3	2	
4		1		4
5√			5	
6√			5	
7				5
8	3	2		
9	3	2		
10�		1	2	2
11		5		

12		5		
13		4	1	
14		5		
15�		3	2	

Antepenultimate

Penultimate

✓ Native-like Production

� Undecided

Ultimate

Therefore, the ALIGN LEFT constraint is active and highly ranked in the interlanguage of some learners, namely 8, 9, 11, 12, 13 and 14, which leads to stressing the syllables that are close to the left edge. Candidates (f) and (g) compete at being optimal outputs as both equally violate RIGHTMOST and satisfy ALIGN-LEFT. However, violating the RIGHTMOST constraint twice still does not exclude them from stress computation. One might assume that the violation of DEP μ and MAX μ would exclude candidate (g) and promote candidate (f) as being optimal as shown in 6.10 C.

Tableau 6.10 C: Learners

/mid'zawwiʒ/	FTBIN	ALIGN L	RMOST	PARSE σ	SWP	DEP μ	MAX μ
a.(mid)('zaw) <wiʒ>		*!	*				
b.'(mid) (za) <wiʒ>	*!		**				*
c. (mid) ('zu:) <wiʒ>		*!	*			*	*
d. (mid) ' (za) <wiʒ>		*!	*		*		*
e.'(mid) za <wiʒ>			**	*!			*
✓f.'(mid) (zaw)<wiʒ>			**				
g. '(mid) (zaː)<wiʒ			**			*!	*

In 6.11, both candidates (a, b) are produced by the learners, so lengthening the vowel and deleting the coda in the production of some instances do not affect the stress assignment because /zaw/, /zaː/ and /zuː/ are equal-weight syllables. The node of the coda is compensated by the length. Hence, the lost mora position is refilled by the length of the vowel which can legitimise the suggestion that candidates (b) and (c) do not violate DEP μ and MAX μ. Consequently, candidate (c) is eliminated due to the violation of ALIGN LEFT and candidates (a) and (b) are actual production by the learners.

Tableau 6.11: Learners

/mid'zawwiʒ/	FTBIN	ALIGN-L	R-MOST	PARSE σ	SWP	DEP μ	MAX μ
✓a.'(mid) (zaw)<wiʒ>			**				
⟶b. '(mid) (zaː)<wiʒ			**				
c. (mid) ('zuː) <wiʒ>		*!	*				

The native speakers, as well as learners who produced native-like forms (in terms of stress assignment), low-ranked ALIGN LEFT constraint to allow words with penultimate stress to win in the stress computation. Similarly, the ranking of FT-BIN> DEPµ> MAX µ> RIGHTMOST > PARSE σ> SWP> ALIGN LEFT will be employed in tableau 6.12. Both candidates (a) and (c) are optimal. This disagrees with the native speakers, (as the coda of the penultimate syllable was constantly maintained in their production, while there were occasions when some modifications such as deleting the coda occurred in the learners' pronunciation). It is, however, not in the interest of this study to investigate this issue because it seems that it does not affect the assignment of stress, but rather affects the structure (in this particular pattern). If we assume that candidate (c) also violates DEPµ, then the optimal candidate will be candidate (a), the native speaker's production.

Tableau 6.12: Native speakers and Native-like Production

/mid'zawwiʒ/	FTBIN	DEPµ	MAXµ	RMOST	PARSE σ	SWP	ALIGN-L
✓a.(mid)('zaw) <wiʒ>				*			*
b.'(mid) (za) <wiʒ>	*!		*	**			
→c. (mid) ('zu:)<wiʒ>				*			*
d. (mid) ' (za) <wiʒ>	*!		*	*		*	*
e.'(mid) za <wiʒ>			*!	**	*		
f.'(mid) (zaw)<wiʒ>				**!			
g. ' (mid) (za:)<wiʒ				**!			

6.2.4 cvc.CVC.cv Pattern (3)

In section (5.2.1.3), the results were significant and there was a consensus among the learners to stress the penultimate syllable in accordance with LA stress patterns. The reason that the antepenultimate syllable is stressed by a small minority of learners might come from the fact that the closed penultimate syllable is stressed less (rarely stressed) in words with open ultimate. (cf *chimpan*.'*zee* and '*Timbuctoo*). However, it seems that the learners did not find cvc.CVC.cv (pattern 3) as difficult as cvc.CVC.cvc (pattern 2) structure. Consequently, the majority of instances showed that the learners acquired the L2 patterns by stressing the penultimate syllable. The question is what makes cvc.CVC.cv different from CV.cv.cv, cv.CV:.cv, and cvc.CVC.cvc in the learners' interlanguage? Why did the learners show agreement in stressing the target syllable in the cvc.CVC.cv, but not in the other patterns? The only difference I am aware of in terms of structure is that patterns (1), (2) and (7) are equal in their openness and closure, but pattern (3) is not as the ultimate syllable is the open one. In fact, this factor should not be relevant as it has been noticed that the ultimate syllable is excluded from the computation of stress in the majority of instances. So cvc.CVC.cv and cvc.CVC.cvc structures should be evenly treated by the learners. However, the results show that the learners treated them differently and apparently cvc.CVC.cv is less marked than cvc.CVC.cvc, which possibly helps in attaining more accurate production on the cvc.CVC.cv structure.

Therefore, it is necessary to delve into the individual performances again and try to determine who was unsuccessful in producing penultimate stress and whether a relationship can be established between the performance of the learners in the cvc.CVC.cv and the cvc.CVC.cvc structures.

Table 6.3 Variation among the individuals in patterns (2) and (3)

	cvc.CVC.cv Pattern 3				cvc.CVC.cvc Pattern 2				
Par	Pre	A	P	U	Par	Pre	A	P	U
1√			3		1			4	1
2√			3		2√			5	
3√			3		3�		3	2	
4�			2	1	4		1		4
5√			3		5√			5	
6√			3		6√			5	
7√			3		7				5
8	1	2			8	3	2		
9 �		1	2		9	3	2		
10�			2	1	10�		1	2	2
11	1	2			11		5		
12		3			12		5		
13√			3		13		4	1	
14√			3		14		5		
15√			3		15�		3	2	

Antepenultimate Penultimate

√ Native-like Production � Undecided

Ultimate

In Table 6.3, participants 8, 9 and 12 stressed the left-side syllable. Interestingly enough the same individuals showed a preference for stressing the antepenultimate or pre-antepenultimate syllables in patterns (1), (2) and (7). This supports the fact that the

ALIGN-LEFT constraint is active and highly ranked in some learners' interlanguage, but the opposite is true for the natives and learners who accurately assigned stress on the target items, where ALIGN-LEFT is low ranked. The table below displays the performance of the individuals and compares patterns (2) and (3). In fact, some kind of agreement among the learners was found. There was agreement between participants 1, 2, 5 and 6 on stressing the penultimate syllable and an agreement among participants 8, 11 and 12 on stressing the left side-syllables.

Applying the previous ranking perfectly elicits the forms produced by the learners who chose to stress the antepenultimate syllables in Tableau 6.13. Candidate (b) wins as it only violates the RIGHTMOST constraint twice.

Tableau 6.13: Learners

/mus.'taʃ.fa/	FT-BIN	ALIGN- L	R-MOST	PARSE σ
a. (mus). ('taʃ). <fa>		*!	*	
✓b.'(mus).(taʃ).<fa>			**	
c.mus.'(taʃ) .<fa>		*!	*	*
d.'(mus).taʃ.fa			**	**
e.'(mus. taʃ).<fa>	*!		*	

The inactivity of the ALIGN LEFT constraint in the native speakers' production and in native-like forms produced by the learners derives the actual stress assignment as seen in Tableau 6.14. So candidate (a) competes with candidate (c), as both violate the RIGHTMOST constraint but candidate (c) is excluded because it violates PARSE σ, the constraint that outranks ALIGN LEFT.

Tableau 6.14: Native Speakers

/mus.'taʃ.fa/	FT-BIN	R-MOST	PARSE σ	ALIGN- L
✓a.(mus).('taʃ). <fa>		*		*
b.'(mus). (taʃ) .<fa>		**!		
c.mus.'(taʃ) .<fa>		*	*!	*
d.'(mus).taʃ.fa		**!	**	
e.'(mus. taʃ).<fa>	*!	*		

6.2.5 cv.CVC.cvc Pattern (4)

The learners produced the attested items successfully. The results were significant (Chapter 5), which means that almost all the learners agreed on stressing a particular syllable, that is the penultimate one. One might suggest that this structure is unmarked as it follows the regular stress patterns of both L1 and L2 (Chapter 3) and consequently it does not cause difficulties for the learners. So will the rankings used above derive the actual stress assignment? As explained earlier, there was variation within the group when the visible structures in trisyllabic words have equal syllable structure in terms of openness and closure. The visible structures in this pattern display unequal structure /cv.cvc/ and consequently, learners should not have a problem. This is exactly what happened as the majority, if not all, of the learners produced native like forms. Both rankings of the constraints – whether ALIGN- LEFT is higher or lower ranked – would give the actual output and the native-like forms produced by the learners.

In Tableau 6.15, ALIGN- LEFT is ranked higher and candidate (a) is chosen to be optimal after competing with candidate (b), which is eliminated because of violating PARSE σ. In

Tableau 6.16, ALIGN- LEFT is dominated and ranked lower; however, candidate (a) is still optimal due to only violating PARSE σ once.

Tableau 6.15: Learners

/mu'handis/	FT-BIN	ALIGN- L	R-MOST	PARSE σ
✓a. mu'(han)<dis>		*	*	*
b.mu'(han) dis		*	*	**!
c. (mu)'(han)<dis>	*!	*	*	
d. (mu'han)<dis>	*!		*	
e. ' (muhan)<dis>	*!		*	
f. mu'(handis)	*!	*		*

Tableau 6.16: Native speakers and Native-like

/mu'handis/	FT-BIN	R-MOST	PARSE σ	ALIGN- L
✓a. mu'(han)<dis>		*	*	*
b. mu'(han)dis		*	**!	*
c. (mu)'(han)<dis>	*!	*		*
d. (mu'han)<dis>	*!	*		
e. ' (muhan)<dis>	*!	*		
f. mu'(handis)	*!		*	*

To recap, pattern (4) confirms that the learners showed variability within the group in patterns that are equal in terms of openness or closure, but when the visible structure (i.e. the syllables that are not extrametrical) was not equal, the variability does not exist and both rankings are successful in accounting for stress assignment. This explains how the learners' interlanguage works variably to account for stress assignment in equal syllable structures but the grammar of the learners converges to account for the unequal syllable structures in pattern (4).

6.2.6 CV.cvc.cv Pattern (5)

This pattern is different from the previous ones. First, stress skips the heavy penultimate into the light antepenultimate syllable. Second, it is considered as a marked placement of stress (opaque stress, Chapter 3) because it does not occur on the default position of stress in LA. Third, what is pronounced is only the surface structure and the learners are perhaps not aware of the inner (underlying) structure.

Learners in pattern (4) are highly successful at locating stress as it represents a regular pattern and the stress falls on the heavy penultimate syllable. This might suggest that the regular stress pattern is straightforwardly acquired, while the irregular pattern is not so easily accessible even though it exists in the L1 in words like '*calendar* or '*faculty* (H3-2). This has been found in another study conducted by Jleiyal (2004). She tested Libyan Arabic learners of English who made errors in words like '*calendar* or '*faculty* by stressing the heavy penultimate syllable. Although words that skip the heavy penultimate to stress the light antepenultimate syllable such as in /'madirsa/, /'makinsa/ and /'yikitbu/ are available in LA, the learners made mistakes (as explained before). This is possibly because only regular and predictable forms are transferred and the irregular pattern in the L1 cannot be stored in the L2 (Liceras 1988, Mazurkewich 1984). In other words, the irregular and unpredictable grammar is only stored in L1 and are not easily accessible in L2. Similarly, the participants in the current study almost show at consensus in stressing the penultimate syllable, where the results were significant as shown in Chapter 5, regardless of the availability of this irregular pattern in their L1.

Moreover, the irregular L2 structure is not compatible with the irregular structure in the L1. It is believed that if trisyllabic words end in an /i/ or a syllabic consonant (which is not pronounceable in some varieties of English and instead the word would end in /ə/), then stress might pass over the heavy penultimate to the light antepenultimate syllable in English (Hammond 1999). However, the stress in Libyan Arabic in this pattern does not apply to the surface form (Chapter 3). The learners are not aware of the underlying representation of the structure and whether the vowel is a genuine vowel that carries a mora and attracts stress, or whether it is an epenthetic vowel that occurs after the assignment of stress. It is claimed that unpredictable patterns are stored in the lexicon (Hall 2007; Kramer 2012); therefore, stress assignment on irregular forms would be correctly assigned by natives in their L1 regardless of their awareness of stress assignment rules. The difference between English and Arabic in this pattern is that in English and Arabic, syllables are syllabified and the stress assignment subsequently takes place but, in Arabic, there are cases where the final syllabification might occur after stress assignment. This results in cases where the light antepenultimate syllable ends up as a stress bearer syllable as the heavy penultimate one is an illegitimate syllable and cannot receive stress.

As learners assign stress to the surface form, the CVC penultimate syllable is dealt with as if it is a genuine heavy syllable. The ranking of constraints for the individuals who promote left-side stressed syllables and the ranking for those who promote penultimate stress converges to derive the optimal output *ma'(dir)<sa>. Whether the ALIGN- LEFT constraint is ranked higher or lower, candidate (b) competes with candidate (a) and candidate (b) is excluded as it violates PARSE σ twice as in 6.17. This means that ALIGN-LEFT is active if the pattern in question represents an equal syllable weight. Otherwise, the learners will be sensitive to the non-final heavy syllable.

Tableau 6.17: Learners

A. /'madirsa/	FT-BIN	NON-FIN σ	ALIGN- L	R-MOST	PARSE σ
✓a. ma'(dir)<sa>			*	*	*
b. ma'(dir)sa			*	*	**!
c. ma'(dirsa)	*!	*	*		*
d. ' (ma) (dir) <sa>	*!			**	
e. ' (madir) <sa>	*!			*	
f. (ma) ' (dir) sa	*!		*	*	*
B. /'madirsa/	FT-BIN	NON-FIN σ	R-MOST	PARSE σ	ALIGN- L
✓a. ma'(dir)<sa>			*	*	*
b. ma'(dir)sa			*	**!	*
c. ma'(dirsa)	*!	*		*	*
d. '(ma) (dir) <sa>	*!		**		
e. '(madir) <sa>	*!		*		
f. (ma) ' (dir) sa	*!		*	*	*

Pattern (5) represents an opaque type of stress; it is necessary to explain how light antepenultimate syllables receive stress in the presence of heavy penultimate ones and to explain the assignment of stress as well as the syllabification of this pattern. Therefore, syllabification constraints will be used alongside the unified ranking of prosodic constraints that derive the main stress: FT-BIN, TROCH > NON-FIN σ > R-MOST > PARSE σ> ALIGN- L.

The constraint REDUCE, introduced by Watson (2007), is required to minimise the number of light syllables in the underlying form. This leads to a violation of the constraint MAX V which prohibits the deletion of vowels. Therefore, REDUCE outranks MAX V. Consequently, the reduction of moras will create a cluster that might cause a violation to the SSP constraint[32]. Therefore, in order to satisfy the SSP, a vowel should be inserted. As a result, the DEP V constraint that disallows the insertion of the vowel will be violated; therefore, the SSP outranks DEP V. The location of the insertion cannot be random in a sequence of C**C**C, three consonants. The unsyllabified consonant written in bold should be taken as a coda of the inserted vowel C**i**CC. Mester and Padgett (1994, p. 80) proposed a constraint specifying the position of the epenthetic vowel. That is called SYLLABLE-ALIGN (L): Align (Syll,L,PrWd,L). This alignment constraint requires the syllable that is composed of an epenthetic vowel to be aligned with the prosodic word. So violations will be counted in terms of the number of moras from the epenthetic vowel. In order to guarantee the position of insertion, the inserted vowel should take place after the first consonant from the left. It can be seen below that candidate (b) violates SYLL-ALIGN-L twice because when the vowel inserted, it took the unsyllabified consonant as an onset and allowed the first consonant in the sequence to form a coda with the preceding vowel. Consequently, the coda and the preceding vowel form two moras while in candidate (a) the epenthetic vowel takes the first consonant as an onset so it is only preceded by one mora (i.e. one violation incurs by the preceding vowel).

Tableau 6.18: Application of SYLL-ALIGN-L

CV**CCC**V	SYLL-ALIGN-L	DEP V
→ a. CV.CiC.CV μ	*	*
b.CVC.C**i**.CV μ μ	**!	*

[32] The violation of the SSP constraint is caused by violating the requirement of the Sonority Sequencing Principle (SSP).

SYLL-ALIGN-L is highly ranked with the SSP in a native speakers' grammar. The deviation between the learners' and native speakers' grammar occurs when the epenthetic vowel receives stress in the learners' output. This implies that the epenthetic syllable is treated as a syllable with a genuine vowel. Kenstowicz's constraint *'V (2007) is used to forbid stress on epenthetic vowels. So the violation of *'V is not tolerated by the native speakers and it is highly ranked as opposed to the learners. These syllabification constraints were involved to control the order of syllabification and to interact with prosodic constraints to assign stress from the underlying representation to the output representation.

The constraints SSP, * 'V and SYLL-ALIGN-L outrank REDUCE, FT-BIN > TROCH > NON-FIN σ >R-MOST >PARSE σ >ALIGN- L in the native speakers' production. However, * 'V, REDUCE constraints are ranked lower in the learners' grammar.

In Tableau 6.19, the candidates show different potential forms of underlying representation. Candidates (d), (e), (f) and (g) violate the SSP; candidates (h) and (j) violate FT-BIN; candidates (k), (l) and (m) violate SYLL-ALIGN-L; therefore, they are unsuccessful as the optimal output. When REDUCE constraint is less violated, SSP is fatally violated in candidates (d), (e), (f) and (g) resulting in their exclusion. Other candidates satisfy the SSP constraint but they are excluded due to the violation of other dominant constraints. In the learners' grammar, SSP, SYLL-ALIGN-L, FT-BIN, TROCH are dominant constraints that cannot be outranked or violated. The optimal output candidate (i) competes with candidates (a) and (b): they all satisfy the dominant constraints and the second violation of candidates (a) and (b) to R-MOST constraint exclude them and optimise candidate (i) which only violates R-MOST once.

Tableau 6.19: Learners

/'ma dir sa/	SSP	SYLL-ALIGN-L	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN-L	*'V	REDUCE	DEP V	MAX V
a.'(mada) (rasa)						**!*				****		
b. (mada) (rasa)'				*!	*			*		****		
c. '(mad) (rasa)						**!				***		*
d. '(mad) (rsa)	*!		*			*				*		**
e. (mad) '(rsa)	*!		*		*			*		*		**
f. '(mad) <rsa>	*!					*				*		**
g.'(mad) rsa	*!					*	*			*		**
h. '(ma) (dir) <sa>			*!			**				**	*	**
i. ✓ ma ' (dir) <sa>						*	*	*	*	**	*	**
j. (ma) ' (dir) <sa>			*!			*		*	*	**	*	**
k. (mad) '(risa)		*!				*		*	*	**	*	**
l. ' (mad) risa		*!				**	**			**	*	**
m. ' (mad) (risa)		*!				**				**	*	**

Tableau 6.20 displays the native speakers' grammar and the accurate production of learners. The requirement of SSP, the location of the inserted vowel, the prohibition of stressing the epenthetic vowel and the reduction of the light open syllable are essential requirements in the native speakers' grammar. Therefore, *'V and REDUCE constraints are high ranked to fulfil the requirement of the native speakers' grammar SSP, SYLL-ALIGN-L and *'V dominate REDUCE and FT-BIN. Candidate (h) is the one with fewest violation as it violates REDUCE twice. The FT-BIN constraint is highly ranked and

dominant in transparent stress but it is dominated by other syllabification constraints in opaque stress as illustrated below. The optimal output violates FT-BIN, but its violation does not lead to exclusion.

Tableau 6.20: Native Speakers

/'ma dir sa/	SSP	SYLL-ALIGN-L	*'V	REDUCE	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN-L	DEP V	MAX V
a.'(mada) (rasa)				***!*				***				
b. (mada) (rasa)'				***!*		*	*			*		
c. '(mad) (rasa)				***!*				***				
d. '(mad) (rsa)	*!			*	*			*				**
e. (mad) '(rsa)	*!			*	*		*			*		**
f. '(mad) <rsa>	*!			*				*				**
g.'(mad) rsa	*!			*				*	*			**
h.✓'(ma) (dir) <sa>				**	*			**			*	**
i.ma ' (dir) <sa>			*!	**				*	*	*	*	**
j. (ma) ' (dir) <sa>			*!	**	*			*		*	*	**
k. (mad) '(risa)		*	*!	**				*		*	*	**
l. ' (mad) risa		*!		**				**	**	*	*	**
m. ' (mad) (risa)		*!		**				**			*	**

Logically, assigning stress in a pattern where stress skips from the heavy to the light syllable should be obtained through levels of applications, because the candidates are composed of varied underlying levels: stem and word. Due to the diversity in the structure of the candidates in the above tableau; starting from a sequence of open syllables, passing by candidates composed of clusters and finishing with candidates which have inserted vowels; stress assignment and vowel reduction rationally take place at the stem level and is followed by vowel insertion and stress preservation at word level. The output of the first level will be the input of the second. This invalidates Tableau 6.20 where all candidates are tackled at one level.

Stratal OT will be used to derive the interaction between stress and syllabification in the opaque stress patterns. The stem level is where syllable reduction occurs and causes the SSP violation and the word level is where the vowel insertion takes place to satisfy the SSP while stress is preserved. Candidates (a), (b) and (c) are eliminated as they violate REDUCE the most. Candidates (d), (e), (f) and (g) equally violate SSP and REDUCE. However, candidates (d) and (e) are excluded as they also dissatisfy FT-BIN. What makes candidate (f) optimal is that candidate (g) also violates PARSE σ as below.

Tableau 6.21: Native Speakers (Stem Level)

/'ma-darasa/	SSP	SYLL-ALIGN-L	*'V	REDUCE	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN-L	DEP V	MAX V
a.'(mada) (rasa)				***!*				***				
b. (mada) (rasa)'				***!*		*	*			*		
c. '(mad) (rasa)				***!*				***				
d. '(mad) (rsa)	*			*	*!			*				**
e. (mad) '(rsa)	*			*	*!		*			*		**
f.✓'(mad) <rsa>	*			*				*				**
g.'(mad) rsa	*			*				*	*!			**

In the word level, tableau (6.22) will include candidates showing clusters, insertion of vowels in various positions and stress placed on the epenthetic vowel. Based on the native speakers' grammar, stress reservation from the previous level and the ban on stressing epenthetic vowels should be maintained. The ranking of the constraints is altered in that SSP, SYLL-ALIGN-L, *'V dominate REDUCE at the word level. So candidates that violate either SSP, SYLL-ALIGN-L and *'V are excluded. Although candidate (h) violates FT-BIN, it is chosen as the optimal output because it violates REDUCE twice but other candidates fatally violate dominant constraints.

Tableau 6.22: Native Speakers (Word Level)

/'mad.rsa/	SSP	SYLL-ALIGN-L	*'V	REDUCE	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN-L	DEP V	MAX V
f.'(mad) <rsa>	*!			*				*				**
h.✓'(ma) (dir) <sa>				**	*			**			*	**
i. ma ' (dir) <sa>			*!	**				*	*	*	*	**
j.(ma) ' (dir) <sa>			*!	**	*			*		*	*	**
k.(mad) '(risa)		*	*!	**				*		*	*	**
l.'(mad) risa		*!		**				**	**	*	*	**
m.' (mad) (risa)		*!		**				**			*	**

Optimal output of the learners can be achieved from the ranking of the prosodic constraints alone (if we assume that syllabification constraints are not active and learners deal with the surface structure only) as illustrated in Tableau 6.23 below, or in conjunction with syllabification constraints as shown in Tableau 6.19 earlier. Presumably, the learners do not recognise these different levels and the various structures of the candidates; therefore, stress should be derived through one level of representation and among the candidates which represent the surface structure as seen in Tableau 6.17.

If this is correct, then Tableau 6.19 is invalid. If learners are only aware of the surface structure, then constraints such as *SYLL-ALIGN-L, *'V* and REDUCE s may not be active in the learners' interlanguage.

Tableau 6.23: Learners

/'madirsa/	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN-L
a. '(ma) (dir) <sa>	*!			**		
b. ✓ ma ' (dir) <sa>				*	*	*
c. (ma) ' (dir) <sa>	*!			*		*

To sum up, the prosodic constraints alone can derive the optimal output produced by the learners as they deal with the surface structure only as seen in the tableau above. It cannot, however, derive the optimal output of the native speakers; therefore, syllabification constraints were involved to derive stress based on syllabification patterns. This pattern strongly support H3-2 (Chapter 4).

6.2.7 CV.cvc.cvc Pattern (6)

The learners were not successful in assigning stress in this pattern (see section 4.2.1.6). Stress in L1 and L2 can skip the heavy penultimate to the light antepenultimate syllable but for various reasons. In this pattern, the stress skips from the heavy penultimate to the light antepenultimate syllable because the base of the word receives stress on the light CV and stress is preserved when the possessive morpheme attached to the base. It is an exception as other stems/morphemes allow stress retraction as in /bas.'mit-ha/ *her smile*. A similar pattern is found in English when stress maintains its original position on the stem after affixation as in *'passenger*. However, what the majority of the learners chose in the production of the attested words was to follow the regular predictable pattern. This again, suggests that regular and predictable patterns are applied in the L2 and irregular or unpredictable patterns are not easily accessible in L2.

Stem in pattern CV.cvc.cvc determines the stress and it is not affected by the plural possessive affix. The CV.cvc structure is slightly problematic (as explained in section 3.3.4.3). The final syllable is excluded from stress assignment. So the only visible syllable to be stressed is /CV/ in CV.<cvc>; however, this claim challenges the fact that LA is a biomoraic language and a degenerate foot such as CV is banned (Al-Ageli 1995, Hayes 1995). The other claim is that in a structure such as CV.cvc, the final consonant is weightless as it is associated directly to the prosodic word (CV.CV) <C> or it might create a syllable with an empty nucleus (see figure 3.19 in Chapter 3). If this assumption is acceptable, then the foot binarity condition would be satisfied but PARSE SEGMENT will be violated as a result of leaving the coda unparsed into a foot.

So how do the learners assign stress on this pattern and what constraints make them stress the penultimate syllable? The learners dealt with the surface form of this pattern; similar to pattern (5). FT-BIN, TROCH and NON-FIN σ dominate the rest of the constraints; candidates that violate FT-BIN are eliminated from the computation of stress. The optimal output competes with other candidates in that the former satisfies the dominant constraints. Tableau (6.24) displays how learners probably assign stress on the surface form.

Tableau 6.24: Learners

A. /'kabiʃ-kum/	FT-BIN	TROCH	NON-FIN σ	ALIGN- L	R-MOST	PARSE σ
√a. ka'(biʃ)<kum>				*	*	*
b. '(kabiʃ) <kum>	*!				**	
c. (kabiʃ)'<kum>	*!	*		*	*	
d. ka (biʃ) '(kum)			*!	**		*
e. ' (ka)(biʃ)<kum>	*!				**	

B. 'kabiʃ-kum	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN-L
√a. ka'(biʃ)<kum>				*	*	*
b. '(kabiʃ) <kum>	*!			**		
c. (kabiʃ)'<kum>	*!	*		*		*
d. ka (biʃ) '(kum)			*!		*	**
e. ' (ka)(biʃ)<kum>	*!			**		

How do the native speakers assign stress in the stem and preserve stress location after affixation? If I apply the same constraints and ranking used by the learners, the optimal output will not be the actual output by the native speakers. The optimal candidate will be *ka'(biʃ) and this is not the case, as the light CV receives stress in the native forms. Therefore, candidate (f) is introduced below; following the claim that the last consonant is directly associated with the prosodic word in order to satisfy the requirement of the bimoraic foot (cf. Figure 3.19). Candidate (f) is the optimal output; however, it does not comply with all the constraints. It violates PARSE SEG that prohibits the unparsed segments or syllables in the process of stress assignment. Candidate (f) competes with candidate (a). Candidate (d) is excluded as it violates FT-BIN that is satisfied by the optimal and the violation of NON-FIN σ excludes candidate (a) as shown in Tableau 6.25.

Tableau 6.25: Native Speakers (Lexical Level)

/'kabiʃ-kum/	FT-BIN	TROCH	NON-FIN σ	WSP	R-MOST	PARSE σ/SEG	ALIGN-L
a. ka'(biʃ)			*!			*	*
b. '(kabiʃ)	*!		*	*	*		
c. (kabiʃ)'	*	*!	*		*		
d.'(ka) <biʃ>	*!				*		
e.'(ka)(biʃ)	*!			*	*		
f.✓ '(kabi)ʃ						*	

However, applying the same constraints at a post lexical level, where the possessive plural morpheme is added to the stem, would not provide us with the actual output produced by the native speakers. As can be seen below in 6.26, the optimal candidate (a) is the output produced by the learners (cf Tableau 6.24). It competes with the actual output (f) in that the latter violates WSP so it is eliminated.

Tableau 6.26: Native Speakers (Post Lexical Level)

/'kabiʃ-kum/	FT-BIN	TROCH	NON-FIN σ	WSP	R-MOST	PARSE σ/SEG	ALIGN-L
a. *ka'(biʃ)<kum>					*	*	*
b. '(kabiʃ) –<kum>	*!			*	*		
c. (kabiʃ)'-<kum>	*	*!			*		
d. '(ka) (biʃ) <kum>	*!			*	**		
e. (ka)'(biʃ)- <kum>	*!				*		*
f. '(kabi)ʃ -<kum>				*!	*	*	

Therefore, a faithful constraint that guarantees the compatibility of stress assignment at different levels is required in the native speakers' grammar to ban the retraction of stress towards the heavy penultimate syllable by the learners. So a constraint such as IDENT-STRESS[33] which was introduced by Pater (2000) and Collie (2007) will be used to derive the native speakers' forms. The stress bearer syllable chosen by the native speakers violates WSP at post lexical level. Although the requirement of this constraint is fundamental in both English and Arabic as they are considered quantity sensitive languages, only the learners give priority to this prerequisite in contrast to the native speakers in this pattern. This is possibly because the learners do not recognise, or do not store, exceptions in their L2 where stress preservation takes place and bans stress retraction towards a heavy non-final syllable. Therefore, IDENT-STRESS is highly ranked to outrank WSP in the native speakers' production; whereas the opposite occurs in the learners where IDENT-STRESS is demoted and consequently it is dominated by WSP.

[33] This constraint is similar to NEUTRALITY constraint introduced by Hammond (1999).

In Tableau 6.27, candidates (b), (c), (d) and (e) fatally disobey the dominant constraints to leave candidate (a) and (f) competing to win. Candidate (a) is eliminated as the stress position in the stem is not preserved in the output; candidate (f) is the winner because it only violates low-ranked constraints and maintains the stress location in the various levels as shown below.

Tableau 6.27: Native Speakers (Post Lexical Level)

/'kabiʃ-kum/	FT-BIN	TROCH	NON-FIN σ	IDENT-STRESS	WSP	R-MOST	PARSE σ/SEG	ALIGN-L
a. ka'(biʃ)<kum>				*!		*	*	*
b. '(kabiʃ) <kum>	*!				*	*		
c. (kabiʃ)'<kum>	*!	*		*		*	*	
d. ka(biʃ)'(kum)			*!	*	*		*	*
e. '(ka)(biʃ)<kum>	*!					*		
f. ✓ '(kabi)ʃ<kum>					*	*	*	

IDENT-STRESS is demoted and outranked by WSP in the learners' grammar because (1) the learners do not acquire the irregular/unpredictable pattern of preserving stress at different levels and (2) the quantity-sensitivity requirement is more active in the learners' grammar and accessible in their L2. So the learners deal with the surface form of this structure and consequently stress the heavy syllable regardless of its underlying form. Therefore, the output produced by the majority of learners is derived and chosen as optimal when WSP outranks IDENT-STRESS. Candidate (f) is excluded after violating WSP, leaving candidate (a) winning the stress assignment computation as illustrated below (6.28).

Tableau 6.28: Learners (Post Lexical Level)

/'kabiʃ-kum/	FT-BIN	TROCH	WSP	NON-FIN σ	IDENT-STRESS	R-MOST	PARSE σ/SEG	ALIGN-L
a. ✓ka'(biʃ)<kum>					*	*	*	*
b. '(kabiʃ) <kum>	*!		*			*		
c. (kabiʃ)'<kum>	*	*!			*	*	*	
d. ka(biʃ)'(kum)			*!	*	*		*	*
e. '(ka)(biʃ)<kum>	*!					*		
f. '(kabi)ʃ<kum>			*!			*	*	

To sum up, quantity sensitivity is prioritised by the learners; perhaps because it is a prominent and active feature in their interlanguage and it is a less marked and straightforward requirement in stress assignment in their L1 and L2; and possibly the learners could not acquire or store unpredictable patterns in the L2 or could not reach or transfer the unpredictable patterns in their L1.

Table 6.4 below compares the individual performance in patterns (4), (5) and (6). This table confirms previous findings that the variation sometimes occurs within the group but not the individuals from the group. Participant (6) is accurate in her production across the majority, if not all of the patterns and participant (12) shows accuracy in production when stressing the marked (irregular) light antepenultimate syllable. However, the majority tend to stress the heavy penultimate syllable if the patterns construct unequal syllables.

Table 6.4: Variation among the Individual in Patterns (4), (5) and (6)

Pattern 4 cv.CVC.cvc				Pattern 5 CV.cvc.cv				Pattern 6 CV.cvc.cvc			
Par	A	P	U	Par	A	P	U	Par	A	P	U
1✓		3		1		5		1		3	
2✓		3		2		5		2		3	
3✓		3		3		5		3		3	
4�		1	2	4			5	4			3
5✓		3		5		5		5		3	
6✓		3		6✓	5			6✓	3		
7✓		3		7		5		7			3
8✓		3		8		5		8		3	
9✓		3		9		5		9✓	3		
10✓		3		10		5		10			3
11✓		3		11�	3	1	1	11		3	
12✓		3		12✓	5			12✓	3		
13✓		3		13		5		13		3	
14✓		3		14		5		14�	1	2	
15✓		3		15		5		15		3	

Antepenultimate

Penultimate

✓ Native-like Production

� Undecided

Ultimate

6.2.8 Cvc.CVː.cv Pattern (8)[34]

If the claim made here is correct, then the learners should perform more successfully in this pattern because it represents a predictable and regular pattern in the L2 where the heavy penultimate is the stressed syllable. Consequently, the learners would not need to recall unpredictable patterns from their L1 or to acquire and apply exceptional unpredictable patterns in the L2. In fact, the majority of learners produced the items accurately with stress on the heavy penultimate syllable. However, a minority of items were produced with incorrect stress on the antepenultimate syllable (section 4.2.1.8).

A question arises as to what the reason behind this performance could be. The successful production is perhaps, as mentioned earlier, a result of the actual target syllable occupying the default position and it representing a default structure (i.e. a bimoraic syllable). This supports the prediction made by H2 & H3-1 discussed in Chapter 4.

It can be noticed that in some learners' interlanguage (in this pattern as well as other patterns), that ALIGN-LEFT is active and outranks other constraints. This conflicts with the learners' L1 and L2 where ALIGN RIGHT outranks other prosodic constraints to derive stress in English (Benua, 2000) and LA (Al-Ageli, 1995). This excludes the possibility of L1 influence on L2 and suggests the possibility that the learners try to build their interlanguage. White (1998) states that there are situation in the L2 where a likelihood effect of UG might be found; one of these situations being when the learners do not resort to either the L1 or L2 and depend instead on Universal principles (Youssef and Mazurkewich, 1998). Does this mean that learners in this study have access to UG? What is the status of the ALIGN-LEFT constraint? Researchers found that in the early stages of

[34] Pattern (7) is explained at the beginning of this chapter after pattern (1).

acquisition of stress by English and Dutch children, the first syllable in a word receives stress which implies that ALIGN-LEFT is highly ranked during the first stages of acquisition. The more progress the child makes, however, in acquiring the language, the less prominent the ALIGN- LEFT constraint becomes in the children's production (Fikkert 1994, Demuth & Fee 1995, Demuth 1996). This suggests that unmarked structures emerge first represented by stressing the left-side syllables (Demuth 1995; Gnanadesikan 1995). Possibly, the more progress the learners make the less access they have to UG. This does not mean that the leaners in this study have a full access to UG but it shows that ALIGN-LEFT is some extent active in their interlanguage

Prosodic constraints used in previous patterns will be employed to derive the stress in this pattern. When the ALIGN-LEFT constraint is high ranked by some learners in their interlanguage, the leftmost-side syllable will attract stress. Candidates (a) and (d) equally violate R-MOST; but candidate (d) is excluded as it also disobeys PARSE σ. So the winner candidate is (a) as can be seen in tableau (6.29).

Tableau 6.29: Learners

'/darbu:ka/	FT-BIN	TROCH	NON-FIN σ	ALIGN-L	R-MOST	PARSE σ
✓a. '(dar)(bu:)<ka>					**	
b. (dar) ' (bu:)<ka>				*!	*	
c. dar '(bu:)<ka>				*!	*	*
d. '(dar) bu:<ka>					**	*!
e. (dar bu:)' <ka>	*	*!			*	

ALIGN- LEFT is low-ranked in the grammar of the native speakers and the majority of learners who presumably made progress towards native-like competence. The winner candidate is (b), which violates R-MOST and ALIGN- LEFT. It competes with candidate (c) since that the latter also violates PARSE σ.

Tableau 6.30: Native Speakers

/dar'bu:ka/	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN- L
a. '(dar)(bu:)<ka>				**!		
✓b. (dar) '(bu:)<ka>				*		*
c. dar '(bu:)<ka>				*	*!	*
d. '(dar) bu:<ka>				**!	*	
e. (dar bu:)' <ka>	*	*!		*		

Arguably, if the learners do not have access to UG, then why do the learners stress the left-side syllable when it is agreed that ALIGN RIGHT is more prominent in the L1 and L2. It is difficult to prove whether it is an effect of UG or a generalisation made by the learners to reset rules.

Two observations are found: (1) the learners showed a consensus in avoiding a left-side syllable if it was light; the left-side syllable will be chosen by some learners if the structure involves equal-weight syllables. (2) It is also noticed that learners do not transfer unpredictable or marked structure from L1 and do not absorb unpredictable structures in their L2. Finally, a conclusion can be drawn that the learners are highly sensitive to syllable weight; however, in the absence of this distinction some learners would resort to the left-side syllable, which is claimed by researchers to be the structure that emerges first in children's production Fikkert 1994, Demuth & Fee 1995, Demuth 1996).

6.2.9 CVC.cv.CVːC Pattern (9)

In English, extrametricality is applied to nouns, but not all of them – some nouns are exempted from extrametricality. This occurs if the final syllable is superheavy such as in *maga'zine* and *Japa'nese* but this is not always the case, as other words such as '*sensodyne* and *'marmalade* receive stress on the antepenultimate syllable in the presence of final superheavy syllable. In LA, the final syllable is constantly stressed if it is superheavy such as in /bukki'ʃaːʃ/ *Lizard* or occasionally stressed if it is heavy such as in /ma'ħal/ *shop* or /buxa'laː/ *greedy* .The question is whether stressing the final superheavy syllable is considered as an exception or whether excluding it is the exception in English and Arabic. In LA, stressing the final heavy syllable is the exception and this pattern is only applied within certain phonological environments but stressing the final superheavy syllable is not an exception as it is regularly stressed in this dialect. It has been noticed before that the learners apply regular patterns in their L2; exceptional patterns were hardly transferred from the L1 or acquired from the L2.

In fact, very few learners correctly stressed the ultimate syllable in accordance with the native forms. The rest of the learners assigned stress on either the penultimate or the antepenultimate syllable. The learners were undecided in choosing the stressed syllable; accordingly the result in Chapter 5 was not significant in this pattern. What is worth mentioning is that the learners lengthen the penultimate syllable when it is stressed and this complies with what is found in Chapter 5 about assigning stress on bimoraic syllables. If stressing the final superheavy syllable is a regular pattern in L2, then why do some learners avoid it? Stressing the final superheavy in L1 is an exception to the extrametricality requirement of excluding the final syllable in English nouns (Domahs 2014). It is also stated that the superheavy syllable is more marked than other types of syllable (Spaelti 2000), or perhaps the quantity distinction in vowels is not as easily recognised in the superheavy syllables. This opens the door to further future study; in order to see how learners of Arabic will perceive the distinction between long and short vowels. Some learners correctly produced stress on the ultimate syllable. However, the established constraint ranking used before does not provide the actual output. In the tableau below, candidate (e) is optimal as it violates R-MOST and ALIGN- L after it competes with candidate (c); the latter disobeys R-MOST twice. The optimal output does not violate the requirement of FT-BIN because it has been noticed that the vowel of the optimal candidate is lengthened by the learners when it receives stress, but it does violate DEP µ as can be seen below.

Tableau 6.31: Learners (Stressing Penultimate)

/fir ha 'ni:n/	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARSE σ	DEP µ	MAX µ	ALIGN- L
a. (fir) ha ('ni:n)	*!		*		*			*
b. (fir) ha '(ni:)<n>			*!		**			*
c. '(fir) ha <ni:n>				**!	*			
d. ' (fir ha) <ni:n>	*!			*				
✓ e. (fir) ('ha:) <nin>				*		*	*	*
f. (fir) '(ha) <ni:n>	*!			*				*

However, the above constraints alone cannot account for the native speakers' patterns. Gouskova (2003) states that, in Arabic dialects, a superheavy syllable always carries stress in the final syllable. Therefore, she proposes a constraint that urges stressing any trimoraic syllable regardless of its location. According to her, WSPμμμ requires that superheavy syllables receive stress and it must outrank FT-BIN and NON-FIN σ to allow the final trimoraic syllable to be stressed. This analysis has a limitation in that final heavy syllable cannot receive stress as the requirement of this constraint is limited to trimoraic syllables only; this problem will be tackled in the next section. In the tableau below, candidate (a) is the optimal output for the native speakers and learners who accurately produced this pattern. Candidates that violate SWPμμμ, DEP μ and MAX μ are fatally eliminated. Candidate (a) incurs a violation to FT-BIN but it does not exclude it; therefore it is chosen as optimal as illustrated below.

Tableau 6.32 Native Speaker (Stressing Ultimate)

/firha'ni:n/	SWPμμμ	FT-BIN	DEP μ	MAX μ	NON-FIN σ	R-MOST	PARSE σ	ALIGN-L
a. ✓ (fir) ha ('ni:n)		*			*		*	*
b. (fir) ha '(ni:)<n>	*!				*		**	*
c. '(fir) ha <ni:n>	*!					**	*	
d. ' (fir ha) <ni:n>	*!	*				*		
e. (fir) '(ha:) <nin>			*	*!		*		*
f. (fir) '(ha) <ni:n>	*!	*				*		*

Going back to the incorrect production of learners, constraints SWPμμμ, DEP μ and MAX μ are ranked low as they are demoted and will be ranked more highly if the learners progress in terms of accuracy in production. However, ALIGN- L is the dominant constraint to stipulate whether the learners produce items with penultimate or antepenultimate stress. The learners did not agree on the direction of the stressed syllable but agree on the weight of the stressed syllables. This is evidenced in the lengthening of the vowel prior to stress when the penultimate syllable attract stress. When ALIGN- L is ranked low, candidate (b) is the optimal output as it only violates R-MOST once. When ALIGN- L outranks R-MOST, candidate (a) becomes the optimal candidate as it satisfies ALIGN- L as can be seen in the tableau below.

Tableau 6.33: Learners

A. /fir ha 'ni:n/	R-MOST	ALIGN- L
a. '(fir) ha <nin>	**!	
b. ✓ (fir) '(ha:) <nin>	*	*
B. /fir ha 'ni:n/	ALIGN- L	R-MOST
a. ✓'(fir) ha <nin>		**
b. (fir) '(ha:) <nin>	*!	*

It has been found that the condition of ALIGN- L constraint is active if syllables are weight-equal; however, it is found that it also becomes active in this pattern provided that the learners create an equal syllable weight by lengthening the vowel of the penultimate syllable. The learners show uncertainty about this pattern as the number of the stressed instances in the three positions is more or less equal, as has been shown in Chapter 5. We cannot accept variable ranking of constraints; therefore, we will look again in depth at the individual's performance to see if the performance of each participant is consistent among the patterns.

Table 6.5: Variation among Individuals in Patterns (8) and (9)

Pattern 8 cvc.CV:.cv				Pattern 9 cvc.cv.CV:C			
Par	A	P	U	Par	A	P	U
1�	3	2		1		3	
2√		5		2√			3
3�	2	3		3�	2	1	
4√		5		4√			3
5√		5		5		3	
6√		5		6√			3
7√		5		7	3		
8	5			8		3	
9	5			9	3		
10√		5		10√			3
11	5			11�		2	1
12	5			12	3		
13	5			13	3		
14√		5		14	3		
15√		5		15		3	

Antepenultimate

Penultimate

� Undecided

√Native-like

Ultimate

In Table 6.5 above, it can be noticed that, for example, ALIGN-L is ranked higher than R-MOST in the production of participants (9), (12) and (13). Moreover, the named participants are consistent in stressing the antepenultimate syllable in other patterns which means that ALIGN-L is ranked highly in those individuals' interlanguage. The opposite is true, when participants (1), (2) and (5) among others show a regularity in stressing the penultimate syllable. This implies that ALIGN-L is lower ranked in their grammar which means that learners possibly make generalisations about their L2 production as found in Taylor's work (2011 a, 2011 b).

6.3 Phonologically Conditioned Patterns of Disyllabic Words

6.3.1 cv.CVːC Pattern (10)

If learners apply their L1, then final superheavy syllables have more chance to receive stress compared to heavy syllables in the final position. In fact, the learners do not show the anticipated performance. The learners avoided final superheavy syllables in accordance with their performance in pattern (9) in nearly half of the produced instances. Therefore, the ranking of constraints used in pattern (9) will be employed below to account for the incorrect production of the learners. In Tableau 6.34 A and B below, we can see that whether ALIGN- L constraint is dominated by R-MOST or not, the optimal candidate is candidate (b) that violates R-MOST, DEP μ, MAX μ and it competes with candidate (a) which is excluded as it violates a higher ranked NON-FIN σ constraint.

Tableau 6.34: Learners

A. /ki'sa:n/	FT-BIN	TROCH	NON-FIN σ	R-MOST	PARESE	SWPμμμ	DEP μ	MAX μ	ALIGN-L
a. ki '(sa:)n			*!		**	*			*
b. ✓ ('ki:) <san>				*			*	*	
c. '(ki) <sa:n>	*!			*		*			
d. ki '(sa:n)	*!		*		*				*

B. /ki'sa:n/	FT-BIN	TROCH	NON-FIN σ	ALIGN-L	R-MOST	PARESE	SWP μμμ	DEP μ	MAX μ
a. ki '(sa:)n			*!	*		**	*		
b. ✓ ('ki:) <san>					*			*	*
c. '(ki) <sa:n>	*!				*		*		
d. ki '(sa:n)	*!		*	*		*			

Similar to pattern (9), in order to account for native speakers' production, the violation of SWPμμμ, DEP μ and MAX μ are not tolerated by the native speakers. The listed constraints are high-ranked in the native speakers' forms but they are demoted in the learners' grammar (Tableau 6.34). SWPμμμ outranks FT-BIN and DEP μ and MAX μ dominates NON-FIN σ.

Candidate (d) is the actual output by native speakers; it violates FT-BIN but satisfies SWPμμμ. Candidate (a) and (c) are out due to the violation of SWPμμμ. Candidate (d) competes with (b) which violates correspondence constraints. The latter incurs two violations of dominant constraints, DEP μ and MAX μ but candidate (d) incurs one violation of the dominant constraint FT-BIN, and so (b) is the optimal candidate as illustrated below.

Tableau 6.35: Native Speakers

/ki'sa:n/	SWPμμμ	FT-BIN	DEP μ	MAX μ	NON-FIN σ	ALIGN- L	R-MOST	PARSE σ
a. ki '(sa:) <n>	*!				*	*		**!
b. ('ki:) <san>			*	*!			*	
c. '(ki) <sa:n>	*!	*					*	
d. ✓ki '(sa:n)		*			*	*		*

6.3.2 CV.cvc Pattern (11)

This pattern receives stress on the penultimate syllable. As explained in pattern (6), the last consonant is directly linked to the prosodic word and the final syllable will form a foot with the penultimate syllable, thereby satisfying FT-BIN. So candidate (a) is the optimal one and it competes with candidate (f) as the latter disobeys NON-FIN σ, PARSE and ALIGN- L; therefore, it is eliminated from stress assignment while the optimal (a) violates PARSE as can be seen in Tableau 6.36.

Tableau 6.36: Native Speakers

/'muriʃ/	FT-BIN	TROCH	NON-FIN σ	WSP	R-MOST	PARSE σ/SEG	ALIGN- L
a.✓'(muri)<ʃ>				*	*		
b.'(muriʃ)	*!			*	*		
c.(muriʃ)'	*	*!	*				
d.'(mu) <riʃ>	*!				*		
e.'(mu)(riʃ)	*!			*	*		
f. mu'(riʃ)			*!			*	*

However, a significant number of instances incorrectly received stress on the final syllable. That is opposite to the L1 and L2- English does not receive stress on a final CVC and LA receives stress on the final CVC only under special phonological environments which do not apply to this pattern and will be discussed in pattern (12).

It seems that the learners are targeting the CVC structure. This implies that the learners are very sensitive to syllable weight in accordance with the L1 and L2 but they use it impulsively, in that the CVC syllable is stressed in the final syllable. Turk *et.al.* (1995) found that English speaking children do not necessarily use syllable weight as a cue for stress as the adults do in his study. Moreover, Face (2005, p. 100) found that English speaking learners of Spanish are sensitive to weight but they use it in a different manner to native speakers. They use it as cue to determine unmarked stress in Spanish, actually they make a generalisation about the use of syllable weight. The learners in this study probably make a similar generalisation about using weight as a cue; but they did not manipulate this cue accurately.

To tackle this performance, it means that the WSP in the learners' interlanguage outranks NON FIN σ as quantity sensitivity is important factor and a major cue used by the learners to assign stress in accordance with H2. The final position is not preferred, but it is chosen when it is the only heavy syllable available. So candidate (b) with a stressed heavy final syllable is the optimal candidate for the learners, but in the native performance NON-FIN σ is promoted (i.e. NON-FIN is demoted in learners' IL) to obtain candidate (a) as optimal candidate and to exclude candidate (b). Thus, it seems that syllable weight determines stress in cases of unequal syllable weight, while the End rule determines stress in cases of equal syllable weight.

Tableau 6.37: Learners (A) and Native Speakers (B)

A./'muriʃ/	FT-BIN	WSP	NON-FIN σ
a. '(muri)ʃ		*!	
b. ✓ mu'(riʃ)			*
c. ('mu)<riʃ>	*!		
B./'muriʃ/	**FT-BIN**	**NON-FIN σ**	**WSP**
a. ✓('muri)ʃ			*
b. mu'(riʃ)		*!	
c. ('mu)<riʃ>	*!		

6.3.3 cv.CVC Pattern (12)

Although the major interest here is to examine the learners' patterns, the native speakers' pattern will be explained first as it is more complex. As explained in Chapter 3, the final CVC syllable receives stress in disyllabic words when the peak of the syllable is a low vowel and it is preceded by an open syllable. The reason why the final CVC in such a structure receives stress comes from the notion of sonority in the peak of CaC. Cross linguistically, researchers agree that the low vowel /a/ is more sonorous than /u, i/ in the sonority hierarchy of vowels so the marginal low vowel /a/ is the most sonorous sound (Kenstowicz 1997, de Lacy 2002, 2007, Gordon 2006, 2012). Moreover, researchers also agree that sonority cannot just determine the peak and the margins of the syllable, but can also determine which nucleus attracts the stress (McGarrity 2003, Kenstowicz 1994, de Lacy 2002, and Smith 2002). Hayes (1995, c.f. Prince 1983) argue that a mora can constitute a grid within the syllable domain. The number of layers is determined by the sonority of the segment that is attached to it. Watson (2007) in explaining some patterns in Yemeni, adopted the same proposal of assigning a ''two layered grid within the syllable'', where the number of moras refers to the degree of sonority of the segment - the more sonorous the segment the higher the value of the column (as shown in Chapter 3)

Therefore, I will assume that the most sonorous vowel /a/ in this pattern has two layered moras, while the less sonorous vowels /u, i/ have one layered mora. The last consonant is not accounted for as we assumed before that is linked directly to the upper layer and is weightless in the final position.

So the PEAK PROMINENCE (PK PROM) constraint first introduced by Prince and Smolensky (1993) and adopted by others (Smith 2000, 2002; Wiltshire 2006) will be used. It requires that if a certain segment is intrinsically more prominent than others, then this segment receives stress. In other words, the most prominent peak should attract stress. However, this prominence is restricted to a certain phonological environment: it occurs in the final CVC when it is preceded by an open syllable. Items with a final CaC receives stress only if its peak is a back low vowel but it will not receive stress if the peak of the final CiC is a high vowel. However, the ultimate CaC will attract stress from the penultimate syllable even if the peak of the preceding syllable is composed of a low vowel as in / ma'ħal/ *shop,* but the final CiC would not attract stress whether the peak of the penultimate syllable is composed of a low vowel as in /'malik/ *king,* or a high vowel as in /'muriʃ/ *glass.* So the requirement of the PK PROM- FINAL CVC σ constraint will be restricted to the final CVC position in disyllabic words only.

The learners correctly assign stress to the final position in pattern (12) adopting the same ranking of constraints in pattern (11). In fact, they assign stress correctly in a CV.'CaC pattern (12) but incorrectly in a *CV.'CiC pattern (11) which demonstrates that the learners are sensitive to the weight of the syllable and CVC is considered a heavy syllable in disyllabic words, regardless of its position. It seems that they make a generalisation about the weight of the syllable that is able to attract stress so the WSP constraint treats both CaC and CiC equally and both attract stress in the learners' interlanguage when WSP outranks NON-FIN σ. Candidates with a final CVC will be the winners. It does not conflict with the previous claim that unpredictable patterns are not straightforwardly acquired. Although pattern (12) represents an unpredictable stress pattern, the learners produce this pattern correctly, not because the unpredictable patterns are acquired but because the learners applied unmarked stress patterns based on weight sensitivity to derive stress in patterns (11) and (12) supporting H2. Therefore, the learners produce pattern (12) correctly as it matches with their interlanguage stress patterns based on weight and produce pattern (11) incorrectly when it disagrees with their weight generalisation.

In the tableau below, candidate (f) is the optimal one for the learners because it satisfies the WSP while candidate (a) is excluded because of its violation of the WSP. However, PK PROM- FINAL is not active in the learners' interlanguage and it is demoted below WSP.

Tableau 6.38: Learners

/maħal/	FT-BIN	TROCH	WSP	NON-FIN σ	R-MOST	PARSE	ALIGN- L
a '(maħa)l			*!		*	*	
b. '(maħal)	*!		*		*		
c. (maħal)'	*	*!		*			
d.'(ma)<ħal>	*!		*		*		
e.' (ma) (ħal)	*!		*		*		
f. ✓ma'(ħal)				*		*	*

However, the native speakers react differently to CaC and CiC structures; therefore, PK PROM- FINAL σ will be introduced in the tableau below to guarantee that only a final CaC will attract stress in disyllabic words. So the low vowel will exceptionally attract stress under a specific phonological environment. So candidates (a), (b) and (d) violate PK PROM- FINAL because the low vowel in CaC does not carry stress. Candidate (f) is optimal as it obeys the condition of PK PROM- FINAL. PK PROM- FINAL is not violated in Tableau 6.39 B; however, as the peak of the final CVC is not intrinsically the most prominent segment.

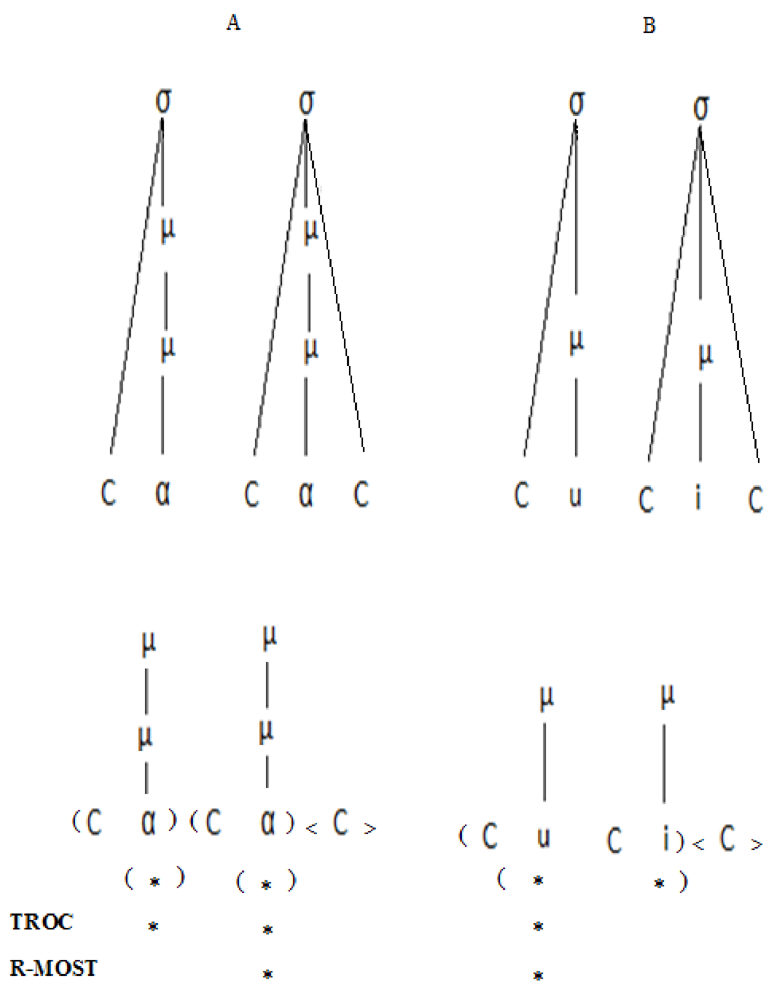
Tableau 6.39: Native Speakers

A. /ma'ħal/	FT-BIN	TROCH	PK PROM- FINAL σ	NON-FIN σ	WSP	R-MOST	PARSE σ/SEG	ALIGN- L
a. '(maħa)l			*!		*	*	*	
b. '(maħal)	*!		*		*	*		
c. (maħal)'	*	*!		*				*
d.'(ma)<ħal>	*!		*			*		
e.' (ma) (ħal)	*!		*		*	*		
f. ✓ma'(ħa)l				*			**	*
B. /'muriʃ/	**FT-BIN**	**TROCH**	**PK PROM- FINAL σ**	**NON-FIN σ**	**WSP**	**R-MOST**	**PARSE σ/SEG**	**ALIGN- L**
a.✓'(muri)ʃ					*		*	
b.'(muriʃ)	*!				*	*		
c.(muriʃ)'	*	*!		*				
d.'(mu) <riʃ>	*!					*		
e.'(mu)(riʃ)	*!				*	*		
f. mu'(riʃ)				*!			*	*

Why does /Ca/ in diagram (6.1/ A) do not receive stress if we assume that the low vowel in disyllabic CV.CVC pattern is a double layered mora? We agreed before that the final consonant is occasionally weightless. To satisfy **FT-BIN**, the penultimate Ca and the ultimate CaC will form two separate bimoraic feet and the final syllable will receive the stress because of the RIGHTMOST. However, in diagram B below, the penultimate Cu and the ultimate CiC form one foot as the final consonant is weightless.

In fact, this analysis is problematic as in a pattern like Ca.**Ca** or in a pattern like CaC.**Ca,** the final syllable includes low vowel but it is not stressed; therefore, we claim that pattern (12) is marked and an exceptional to the norm and the prominence of the peak of the low final vowel is restricted to only a certain phonological environment of CV.**CaC**.

Diagram 6.1: Comparison between Ca.CaC and CuCiC Patterns



Thus, the learners assign stress correctly to pattern (12) because they apply the requirement of the WSP to stress CVC or CVV syllables with no accessibility to exceptions or marked patterns. Evidence can be drawn from their performance in pattern (11) where the final CVC is stressed, satisfying the WSP regardless of any exceptional rules in the L2 so an unpredictable structure is still not accessible in the L2 in accordance with H3-2.

6.3.4 CV.CV Pattern (13)

The learners correctly assign stress in this pattern because: (1) L1 and L2 patterns match (2) it represents an unmarked (predictable) stress pattern and (3) the WSP constraint does not play a role, as the pattern is composed of equal weight syllables. So candidate (a) is optimal, whether or not ALIGN- L is dominated by other constraints. As seen below, candidate (b) is out because of its violation of a number of constraints, mainly TROCHAIC.

Tableau 6.40: Learners

A. /'tˤawa/	FT-BIN	TROCH	WSP	NON-FIN σ	R-MOST	PARSE σ/SEG	ALIGN-L
a.✓ 'tˤawa					*		
b. tˤawa'		*!		*			*

B. /'tˤawa/	FT-BIN	TROCH	WSP	NON-FIN σ	ALIGN-L	R-MOST	PARSE σ/SEG
a.✓'tˤawa						*	
b. tˤawa'		*!		*	*		

The ranking of constraints in LA where **NON-FIN σ** outranks **WSP** will not change the outcome and the actual candidate will be the optimal candidate chosen by the native speakers in the tableau below.

Tableau 6.41: Native Speakers

/'tˤawa/	FT-BIN	TROCH	NON-FIN σ	WSP	R-MOST	PARSE σ/SEG	ALIGN- L
a✓ 'tˤawa					*		
b. tˤawa'		*!	*				*

6.3.5 CVC.CVC Pattern (14)

The learners are successful in stressing the penultimate syllable, possibly because the predictable patterns of the L1 and L2 match in assigning stress. The pattern is composed of equal syllable weight so there is no trigger for the WSP constraint to attract stress to the final syllable according to the learner's interlanguage. Once more, **ALIGN- L** does not affect the production of the learners so candidate (a) is the optimal by the learners in tableaux (6.42 A & B).

Although the ranking of constraints differs between the learners and the native speakers, it still correctly derives the actual candidate as optimal. So candidate (a) violates fewer constraints and becomes the optimal candidate as illustrated in Tableau 6.43 below.

Tableau 6.42: Learners

A. /'maktib/	FT-BIN	TROCH	WSP	NON-FIN σ	R-MOST	PARSE σ/SEG	ALIGN- L
a.✓'(mak)<tib>					*		
b. (mak) '(tib)				*!			*
c. '(maktib)	*!			*			
d.(maktib)'	*!	*		*			*

B. /'maktib	FT-BIN	TROCH	WSP	NON-FIN σ	ALIGN- L	R-MOST	PARSE σ/SEG
a.✓'(mak)<tib>						*	
b. (mak) '(tib)				*!	*		
c. '(maktib)	*!			*			
d. (maktib)'	*!	*		*	*		

Tableau 6.43: Native Speakers

/'maktib/	FT-BIN	TROCH	NON-FIN σ	WSP	R-MOST	PARSE σ/SEG	ALIGN- L
a.✓'(mak)<tib>					*		
b.(mak) '(tib)			*!				*
c.'(maktib)	*!		*				
d.(maktib)'	*!	*	*				*

6.3.6 CVC.CV Pattern (15)

If what I claimed before (that learners apply unmarked stress patterns and the WSP plays a major role in their production if the pattern includes unequal syllable weight) is correct, then the learners will be successful in assigning stress to the penultimate syllable in this pattern. In fact, the learners reached the top limit in their production. It seems the final syllable is excluded from stress assignment as it is not heavy enough to attract stress. So candidate (b) satisfies the dominant constraints and becomes an optimal candidate as seen below.

Tableau 6.44: Learners

/ʃar.ba/	FT-BIN	TROCH	WSP	NON-FIN σ	R-MOST	PARSE σ/SEG	ALIGN- L
a '(ʃar).(ba)	*			*!	*		
b.✓ '(ʃar).<ba>					*		
c. (ʃar.ba)'	*	*!	*	*			*
d. '(ʃar.ba)	*		*!	*	*		
e. (ʃar).'(ba)	*		*!	*			*

It can be noticed that the learners and the native speakers agree on stress assignment where the optimal candidate does not violate NON-FIN σ or WSP. Therefore, the learners are highly successful in stress assignment in patterns (13), (14) and (15).

To conclude, the learners reset rules that are not part of the L1 or L2, that is where ALIGN-L outranks R-MOST. The learners applied the predictable stress patterns when WSP is not violated in assigning stress. The learners also make generalisations about using weight as a cue for stress assignment, but it is used accurately if it is applied in unmarked stress patterns supporting H3-1.

6.4 Mixed Conditioned Patterns

6.4.1 CVC.cvc/cvc.CVC (Active/Passive) Pattern (16)

In English, there are minimal pairs where stress can be assigned on either the penultimate or the ultimate syllable based on their grammatical category: nouns or verbs. In LA, the interface between phonology and grammar is found in active and passive verbs, where stress will be assigned either on the penultimate or ultimate syllable based not only on the grammatical structure, but also on vowel identity.

If the learners aquire the aspect of stress shift between the penultimate and ultimate syllables in accordance with their grammar; will they be able to acquire the relationship between the vowel lowering and stress assignment? The learners need to be aware of three elements: stress position, vowel identity and grammatical category. Two elements are similarly found in English: stress position and grammatical category.

A analysis will be provided to explain how these minimal pairs work. The active form receives stress on the penultimate syllable and the passive form receives it on the ultimate one. The stress placement is triggered by the identity of the vowel – a low vowel attracts stress in the passive form. I will assume that the learners will be familar with stress on minimal pairs. So stress will be assigned based on grammatical category. In fact, the learners are sucessful where the final syllable receives stress in the passive form but they are undecided when the penultimate syllable receives stress (Chapter 5). This can possibly be attributed to the fact that the final syllable in verbs in minimal pairs in English receive stress and the final syllable in verbs are exempted from extrametricality in

English. This can be used as further evidence if the patterns does not exist in L1, then a negative transfer may apply (H3-3).

However, the fact that the identity of the vowel is a trigger has not yet been acquired by the learners in nouns such as */ru'ʃin/ or /ma'ħal/, when the final syllable receives stress by learners because of the requirement of the WSP. The learners are unaware of this feature because verbs such as /*nig'lib/ and /nig'lab/ are produced with stress on the final syllable by the majority of learners since the requirement of NON-FIN σ is limited to nouns. Therefore, one might suggest that the grammatical category is probably used by the learners as a cue for stress assignment (more dicussion is on chapter 8) and that the learners make a generalisation about the grammatical category in verbs and about syllable weight in nouns.

One can claim that when the noun is composed of a CVC.CVC structure, the final syllable is excluded from stress assignment (pattern 14) but when the word is composed of a CV.CVC structure, then the final syllable is stressed (patterns 11, 12). In verbs, the final syllable is stressed in CVC.CVC structures in contrast to nouns, which implies that final syllable in verbs is not excluded from stress. So how will the constraints handle this? When WSP outranks NON-FINAL σ, despite the requirement of NON-FINAL σ, this gives rise to the final stress in CV.CVC structures in nouns or verbs; however, in CVC.CVC structures, WSP more or less has no effect because of the equal structure of the syllables. Therefore, the NON-FINAL σ constraint has to specify the category of the word that should not receive stress on the final syllable. So NON-FINAL σ NOUN will be introduced in the tableau below to ban stress on the final syllable in nouns such as /'maktib/ and allows it in verbs such as */nig'lib/ and /nig'lab/. However, both the CVC.'CVC and 'CVC.CVC structures in verbs satisfy NON-FINAL σ NOUN and WSP; the need of R-MOST and ALIGN- L is demonstrated below to optimise verbs[35] (with equal syllable structure) that receive stress on the final position.

Tableau 6.45: Learners

Noun	WSP	NON-FIN σ NOUN	R-MOST	ALIGN- L
✓CV.'CVC		*		*
'CV.CVC	*!		*	
Verb	WSP	NON-FIN σ NOUN	R-MOST	ALIGN- L
✓CV. 'CVC				*
'CV.CVC	*!		*	
Noun	WSP	NON-FIN σ NOUN	R-MOST	ALIGN- L
CVC.'CVC		*!		*
✓'CVC.CVC			*	
Verb	WSP	NON-FIN σ NOUN	R-MOST	ALIGN- L
✓CVC. 'CVC				*
'CVC.CVC			*!	

It seems that grammatical category has a role in assigning stress in verbs for learners, but the vowel identity triggers stress in the native forms. Therefore, I will claim that there is no evidence that the PK PROM- FINAL σ constraint is active in the learners' interlanguage. On the other hand, there is also no evidence that grammatical category is a motivator in the native speakers' grammar. However, the learners' finality constraint needs to specify the category of the word to determine the syllable that is required to be excluded from stress assignment.

[35] However, R-MOST and ALIGN- L are found to be inconsistent within the participants as some promote ALIGN- L, as explained earlier.

Tableau 6.46: Learners

A. /'niglib/	FT-BIN	TROCH	PK PROM- FIN σ	WSP	NON-FIN σ NOUN	R-MOST	PARSE σ/SEG	ALIGN- L
a. '(nig)<lib>						*!		
b. '(nig lib)	*!					*		
c. ✓ (nig)(lib)'								*
d. (nig lib)'	*!	*						*
B. /nig'lab/	FT-BIN	TROCH	PK PROM- FIN σ	WSP	NON-FIN σ NOUN	R-MOST	PARSE σ/SEG	ALIGN- L
a. '(nig)<lab>			*!			*		
b. '(nig lab)	*!		*			*		
✓c. (nig) '(lab)								*
d. (nig lab)'	*!	*						*
C. /'maktib/	FT-BIN	TROCH	PK PROM- FIN σ	WSP	NON-FIN σ NOUN	R-MOST	PARSE σ/SEG	ALIGN- L
a '(mak)(tib)					*!	*		
b.✓'(mak)<tib>						*		
c. (mak) '(tib)					*!			*
d. (maktib)'	*	*!			*			*

It can be noticed that, in Tableau (A), as a result of not violating NON-FIN σ NOUN, candidates (a) and (c) compete to become the winner but the actual output candidate (c) becomes the winner as it satisfies R-MOST. In Tableau (B), candidates (a) and (b) are excluded leading candidate (c) to be the optimal one. In Tableau (C), candidates (a) and (c) are not chosen because of the violation of Non-fin σ Noun, giving candidate (b) as the optimal one.

In the native forms, Pk Prom- Final σ is crucial in excluding candidates that are not optimal, especially as the requirement of Non-fin is not restricted to nouns. Therefore, in (A) below, candidate (b) disobeys Non-fin σ so it is excluded, leaving '(nig)<lib> as the optimal candidate;in (B) candidate (a) is eliminated as it disobeys Pk Prom- Final σ resulting in (nig) '(lab) winning and in (C), candidate (b) is excluded because it violates Non-fin σ so '(mak)<tib> is chosen as the optimal candidate. Thus, the requirement of Pk Prom- Final σ along with not restricting the requirement of Non-fin σ to nouns would give the actual production of the native speakers based on the ranking of Pk Prom- Final σ > Non-fin σ.

Tableau 6.47: Native Speakers

A. /'niglib/	Pk prom- final σ	Non-fin σ	R-most	Parse σ/Seg	Align- L
a. ✓ '(nig)<lib>			*		
b. (nig) '(lib)		*!			*
B. /nig'lab/	Pk prom- final σ	Non-fin σ	R-most	Parse σ/Seg	Align- L
a. '(nig)<lab>	*!		*		
b. ✓(nig) '(lab)		*		*	*

C. /'maktib/	PK PROM- FINAL σ	NON-FIN σ	R-MOST	PARSE σ/SEG	ALIGN- L
a.✓'(mak)<tib>			*		
b. (mak) '(tib)		*!			*

Thus, the PK PROM- FINAL σ constraint in the learners' interlanguage is not essential, since whether it is demoted or not, the same results will be obtained in contrast to the native speakers. NON-FINALITY σ is not limited to nouns in the native speakers' grammar.

6.4.2 CVC.cvc/cvc.CVCC (1st and 3rd Person, Past, masculine) Pattern (17)

This pattern supports the previous claim that the final syllable attract stress in verbs. In the past 3rd person form CVC.CVC and in the 1st person form CVC.CVCC, the learners produce the majority of instances with final stress as shown in the previous chapter. However, the native speakers produced the past 3rd person form CVC.CVC structures with penultimate stress and the past 1st person form CVC.CVCC structures with ultimate stress. The structure of superheavy syllables in the native form is what pulls stress to the final position. In other words, superheavy syllables always receive stress in LA.

In the tableau below[36], the optimal candidate is (g) in the native production as it violates only R-MOST. Candidates such as (c) and (d) are excluded because of FT-BIN. Candidates

[36] PK PROM- FINAL σ is not included in the tableau as this pattern does not have a low vowel in the final syllable.

(e) and (f) are eliminated because they violate correspondence constraints. Candidates (a) and (b) are not chosen due to the violation of NON-FIN σ.

Tableau 6.48: Native Speakers

/'baddel/	SWPμμμ	FT-BIN	DEP μ	MAX μ	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN- L
a. '(bad) (del)						*!	*		
b. (bad) '(del)						*!			*
c. '(ba) (del)		*!		*		*	*		
d. (ba) '(del)		*!		*		*			*
e.'(baː) <del>			*!	*			*		
f. ba '(del)				*!		*		*	*
g.✓'(bad) <del>							*		

However, in tableau 6.49, the higher ranking of SWPμμμ forces stress to be assigned on the superheavy syllable. So candidates such as (a), (c), (e) and (g) are excluded from stress computation. Candidates (e) and (f) are excluded as they violate correspondence constraints. So the optimal candidate satisfies the SWPμμμ and correspondence constraints but violates the NON-FIN σ constraint which is tolerated because of the requirement of SWPμμμ.

Tableau 6.49: Native Speakers

/bad'delt/	SWPμμμ	FT-BIN	DEP μ	MAX μ	TROCH	NON-FIN σ	R-MOST	PARSE σ	ALIGN- L
a. '(bad) (delt)	*!					*	*		
b. ✓ (bad) '(delt)						*			*
c. '(ba) (delt)	*	*!		*		*	*		
d. (ba) '(delt)		*!		*		*			*
e.'(baː) <delt>	*		*!	*			*		
f. ba '(delt)				*!		*		*	*
g. '(bad) <delt>	*!						*		

In the previous chapter, the results were highly significant in this pattern which indicates that the learners are decisive about assigning stress on the final syllable. In the tableau below, the optimal candidate (b) competes with candidate (f) in that the latter violates PARSE σ, MAX μ and ALIGN- L.

Tableau 6.50: Learners

/'baddel/	FT-BIN	TROCH	NON-FIN σ N	R-MOST	PARSE σ	SWPμμμ	DEP μ	MAX μ	ALIGN- L
a. '(bad) (del)				*!					
b. ✓ (bad) '(del)									*
c. '(ba) (del)	*!			*				*	
d. (ba) '(del)	*!							*	*
e.'(baː) <del>				*!			*	*	
f. ba '(del)					*!			*	*
g. '(bad) <del>				*!					

Although constraint SWPμμμ is low ranked in the learners' interlanguage, the optimal candidate is (b) that receives stress on the final superheavy syllable. So candidate (b) competes with candidate (f) in that the latter violates more constraints than the former, particularly the higher constraint PARSE σ. The optimal candidate is not excluded because the requirement of NON-FIN σ N is limited to nouns; if it is not restricted to nouns, its violation would exclude it from being optimal as shown in the native speakers' tableau 6.49. Therefore, SWPμμμ is highly ranked in the native production.

Tableau 6.51: Learners

/bad'delt/	FT-BIN	TROCH	NON-FIN σ N	R-MOST	PARSE σ	SWPμμμ	DEP μ	MAX μ	ALIGN-L
a. '(bad) (delt)				*!		*			
b. ✓ (bad) '(delt)									*
c. '(ba) (delt)	*!			*		*		*	
d. (ba) '(delt)	*!							*	*
e.'(baː) <delt>				*!		*	*	*	
f. ba '(delt)					*!			*	*
g. '(bad) <delt>				*!		*			

I noticed that some instances that are produced with penultimate stress have no geminate consonants (i.e. the geminate consonant which is the coda of the first syllable is deleted and the vowel lengthened). When geminate consonants are reserved, stress is pulled to the final position.

6.4.3 CVC.cvc/cvc.CVC (Imperative/3rd Masc Past) Pattern (18)

Back to the identity of the vowel and stress position, this pattern displays similar criteria to pattern (16) where the ultimate syllable receives stress if its peak has a low back vowel, otherwise the penultimate one would receive stress. Similarly, in the tableau below in (A), candidate (a) is optimal, while candidate (b) is excluded because of violating NON-FIN σ in the native production. In (B), candidate (b) is not excluded because it satisfies the requirement of PK PROM- FINAL σ where the low vowel attracts stress in contrast to candidate (a) as satisfying NON-FIN σ causes a violation of PK PROM- FINAL σ as illustrated below.

Tableau 6.52: Native Speakers

A. /'ʔalbis/	PK PROM- FINAL σ	NON-FIN σ	R-MOST	PARSE σ/SEG	ALIGN- L
a. ✓ '(ʔal)<bis>			*		
b. (ʔal)'(bis)		*!			*
B. /ʔil'bas/	PK PROM- FINAL σ	NON-FIN σ	R-MOST	PARSE σ/SEG	ALIGN- L
a. '(ʔil)<bas>	*!		*		
b.✓ (ʔil)'(bas)		*		*	*

The tableau below shows that PK PROM- FINAL σ is not active and the requirement of NON-FIN σ NOUN constraint is not violated, leading to stress being applied to the final syllable in verbs in the learners'IL.

Tableau 6.53: Learners

A. /'ʔalbis/	PK PROM- FINAL σ	NON-FIN σ NOUN	R-MOST	PARSE σ/SEG	ALIGN- L
a. '(ʔal)<bis>			*!		
b. ✓ (ʔal)'(bis)					*
B. /ʔil'bas/	PK PROM- FINAL σ	NON-FIN σ NOUN	R-MOST	PARSE σ/SEG	ALIGN- L
a. '(ʔil)<bas>			*!		
b.✓ (ʔil)'(bas)				*	*

Another observation is that when the learners stress the penultimate syllable, the glottal stop is maintained, but there were occasions where the glottal stop is deleted and stress is assigned on the ultimate syllable. Although theoretically the deletion of the glottal stop should not affect stress as the onset does not contribute to the weight of the syllable, it is possible that learners treat /ʔal/ or /ʔil/ syllables differently to other syllables, probably due to the frequency of these syllables, as they are pronounced like definite articles in Arabic. Nonetheless, we cannot base the learners' performance on this assumption; but this observation is worth mentioning and perhaps the emphasis on producing the /ʔal/

and /ʔil/ syllables in /ʔalbis/ and /ʔilbas/ make them more prominent than the following syllable in this pattern.

6.5 Summary and Conclusion

The performance of the learners and the native speakers show that they agree upon the ranking and requirement of some constraints, but that they also disagree upon the conditions and ranking of others. Also, some constraints are required in Libyan Arabic but are not active in the learners' interlanguage. This suggests that constraints are universal but languages themselves or the language of learners based on their competence level determine the ranking and the activity of constraints. Looking at the ranking below shows that there is a difference in both rankings that causes problems for the learners. This resulted in the misplacement of stress in the production of the English-speaking learners. However, a constraint like TROCHEE is violated in neither language; the conditions of FOOT-BINARITY, NON-FINALITY σ and WSP are more respected compared to other constraints. This can be seen in cases where the L1 and L2 match and lead to a high level of accuracy in production in patterns such as (4), (8), (13), (14) and (15).

6.5.1 Ranking of Constraints for Native Speakers

- **Prosodic Constraints:**

SWPμμμ>> FOOT-BINARITY, DEP μ, MAX μ>> TROCHEE >> PEAK PROMINENCE- FINAL σ>> NON-FINALITY σ>> IDENT STRESS>> WSP>> RIGHT MOST>> PARSE σ/SEGMENT>> SWP>> ALIGN-LEFT.

- **Syllabic and Prosodic Constraints:**

SSP, SYLL-ALIGN-L, *'V>> REDUCE>> SWPμμμ>> FOOT-BINARITY, DEP μ, MAX μ >>TROCHEE >> PEAK PROMINENCE- FINAL σ>> NON-FINALITY σ>> IDENT STRESS >> WSP >> RIGHT MOST >>PARSE σ/SEGMENT >> SWP>> ALIGN-LEFT>> DEP V, MAX V.

6.5.2 Ranking of Prosodic Constraints for Learners

The learners show variation within the group, but rarely within the individual. Learners show different rankings, possibly based on their level of proficiency or personal preference as the source and target languages bear words stressed on both the antepenultimate and the ultimate syllables. Comparing the variation among the individuals in Tables 6.1, 6.3, 6.4 and 6.5 (Chapter 6) show that it is possible to create different groups based on the learners' production data: a group that prefers to stress the antepenultimate syllable in the majority of their pronunciation (participants 11, 12, 9, 8 and 14) and another group that prefers to stress the penultimate syllable (participants 5, 2, 3, 1, 2, 15 and 10). However, there were some, such as participants 6, 7, 13 and 4 who showed accuracy in most cases. It is worth mentioning that those four participants achieved a high score in the oral vocabulary test and the conversation test. Therefore, two rankings are adopted: participants who show a tendency to stress the antepenultimate syllable had ALIGN LEFT ranked over RIGHTMOST in their inter-grammar whereas ALIGN LEFT is outranked by RIGHTMOST in the interlanguage of participants that showed a preference for stressing the penultimate syllable.

Ranking (1)

FOOT-BINARITY, TROCHEE>> WSP>> NON-FINALITY σ >> IDENT STRESS>> RIGHT MOST >> PARSE σ/SEGMENT >> SWP>> WSPμμμ, DEP μ, MAX μ>> ALIGN-LEFT.

Ranking (2)

FOOT-BINARITY, TROCHEE>> WSP>> NON-FINALITY σ >> IDENT STRESS>> ALIGN-LEFT RIGHT MOST >> PARSE σ/SEGMENT >> SWP>> WSPμμμ, DEP μ, MAX μ.

- **Inactive Constraints**

PEAK PROMINENCE- FINAL σ, SSP, SYLL-ALIGN-L, *'V, REDUCE. DEP V and MAX V.

6.5.3 Constraint Interaction

6.5.3.1 WSPμμμ and FOOT-BINARITY

The FOOT-BINARITY constraint is highly ranked and un-dominated in the grammar of the native speakers and the learners. However, the only time when FOOT-BINARITY is dominated in the native speakers' grammar is when there is a superheavy syllable; it is outranked by WSPμμμ to stress the superheavy syllable in the final position such as in /min'di:l/ *napkin*. In the learners' interlanguage, FOOT-BINARITY is constantly un-dominated, as the WSPμμμ constraint is outranked by the requirement of the WSP that requires the heavy syllable to attract stress and by the requirement of FOOT-BINARITY.

- **WSPμμμ** must dominate **FOOT-BINARITY** to allow stress on a superheavy syllable in the native forms.

- **FOOT-BINARITY** must dominate **WSPμμμ** to avoid stress on a superheavy syllable in the learners' forms.

Learners of LA need to learn that WSPμμμ is un-dominated and it is not subject to constraint demotion. However, the optimal output by the learners violates WSPμμμ. Therefore, it needs to be re-ranked and demoted below constraints that are responsible for attracting stress assignment on heavy syllables that are mainly FOOT-BINARITY and WSP.

Tableau 6.54: Constraint Interaction

(Native Speakers)	WSPμμμ	FT-BINARITY
/CVC.'CV:C/		
✓CVC.'CV:C		*
'CVC.CV:C	*!	
(Learners)	FT-BINARITY	WSPμμμ
/CVC.'CV:C/		
CVC.'CV:C	*!	
✓'CVC.CV:C		*

6.5.3.2 NON-FINALITY σ and WSP

As mentioned before in LA, the final syllable that is composed of two moras or less does not receive stress unless it is governed by a special phonological environment to attract stress on the final CVC or CV: such as in /ma'mar/ *corridor* or /ʔaɣni'yaː/*the rich*. The final heavy CVC in the learners' interlanguage, might receive stress in the absence of other heavy syllables in the word. This is achieved if WSP outranks NON-FINALITY σ in the production of the learners but NON-FINALITY σ outranks WSP in Libyan Arabic.

- **NON-FINALITY σ** must dominate **WSP** to ban random stress on heavy syllables in final positions in native production
- **WSP** must dominate **NON-FINALITY σ** to allow stress on the heavy syllable in the final position in the absence of other heavy syllables (in the learners' production).

Tableau 6.55: Constraint Interaction

(Natives)	NON-FINALITY σ	WSP
/'CV. CVC/		
CV.'CVC	*!	
✓'CV.CVC		*
(Learners)	WSP	NON-FINALITY σ
/CV.'CVC/		
✓CV.'CVC		*
'CV.CVC	*!	

The learners need to learn that particular syllables under a specific phonological environment might receive stress in a final position. The optimal outputs produced by the learners violate NON-FINALITY σ in order to satisfy the WSP constraint; therefore, the former constraint is re-ranked and demoted to under WSP which learners avoid violating in their production.

6.5.3.3 RIGHTMOST and ALIGN LEFT

In English and LA, NON-FINALITY σ outranks both RIGHTMOST and ALIGN LEFT. So RIGHTMOST is violated in order to obey NON-FINALITY σ. In fact, there is no interaction between NON-FINALITY σ and ALIGN LEFT but there is an interaction between RIGHTMOST and ALIGN LEFT. In English and LA, ALIGN LEFT is low ranked and it is outranked by RIGHTMOST. However, some learners re-rank and demote RIGHTMOST. Actually, this ranking is not part of the L1 or L2. One of the advantages of OT is to provide a platform for the learning process when learners resort to conditions that are not part of either their L1 or the acquired language.

- **RIGHTMOST** must dominate **ALIGN LEFT** to promote stress on the syllable that is closer to the right edge but not the final one as **NON-FINALITY σ** outranks both of the directionality constraints in the native forms.
- **RIGHTMOST** can dominate **ALIGN LEFT** to allow stress to be on the penultimate syllable. However, due to the subgroup of learners (compare section 6.5.2 in Chapter 6) that emerges from the data, **ALIGN LEFT** dominates **RIGHTMOST** to allow stress to be assigned on the antepenultimate syllable or rarely even on the pre-antepenultimate one in the learners' interlanguage.

Tableau 6.56: Constraint Interaction

(Natives)	RIGHTMOST	ALIGN LEFT
/CVC. 'CVC.CVC/		
✓CVC.'CVC.CVC	*	*
'CVC.CVC.CVC	*!*	
(Learners)	ALIGN LEFT	RIGHTMOST
/CVC.'CVC.CVC/		
CVC.'CVC.CVC	*!	*
✓'CVC.CVC.CVC		**

6.5.3.4 **IDENT STRESS and WSP**

The condition of **WSP** constraint is essential in both languages. **WSP** is un-dominated in the learners' interlanguage but it is outranked by other constraints such as **IDENT STRESS** in the native speakers' form**.** This applies in situations where the stem preserves the position of stress after affixation. Moreover, the heavy syllable in such stems does not attract stress. However, the learners consider only the surface form and consequently the optimal output produced by the learners incurs a violation to IDENT STRESS in order to satisfy the WSP. Therefore, IDENT STRESS is demoted to below the less violated constraint.

- **IDENT STRESS** must dominate **WSP** to ban the shift of stress to a heavy syllable after affixation in the native forms.
- **WSP** must dominate **IDENT STRESS** to allow the shift of stress to a heavy syllable after affixation in the learners' interlanguage.

Tableau 6.57: Constraints Interaction

(Natives) /'CV. CVC – CVC/	IDENT STRESS	WSP
✓'CV.CVC-<CVC>		*
CV. 'CVC-<CVC>	*!	
(Learners) /'CV. CVC-CVC/	**WSP**	**IDENT STRESS**
'CV. CVC.<CVC>	*!	
✓CV. 'CVC<CVC>		*

6.5.3.5 **DEP μ and MAX μ**

Faithfulness constraints are needed to regulate the relationship between input and output candidates and to control changes in the structures of the candidates relative to the input. Therefore, faithfulness constraints are more highly ranked in the production of the native speakers but ranked lower in the production of the learners to allow for an adjustment that accommodates their ability to producing items in the L2. Faithfulness constraints are violated when learners change the structure. For example, some structures such as the CVC.CVC.CVC pattern where the nine segments are produced are most likely modified by deleting some codas or inserting vowels. Other structures as the CVC.CV.CVːC pattern, where the final syllable is superheavy, are also modified by shortening the vowel in the ultimate syllable to reject stress. These modifications cause a mora deletion or a mora insertion that are not part of the input. The deletion of the mora incurs a violation of MAX μ and the insertion of the mora incurs a violation of DEP μ. The relation between MAX μ and DEP μ is parallel but the relation between these two faithfulness constraints and other constraints is predominant. Therefore, MAXμ and DEP μ constraints are demoted to the lowest ranking and are outranked by the rest of the constraints in the learners' inter-language.

- **MAXμ** and **DEP μ** must dominate other violated prosodic constraints to ban any changes to the structure of the output in the native forms.
- **MAXμ** and **DEP μ** must be dominated by prosodic constraints to allow changes to the structure of the output in the learners' grammar.

Tableau 6.58: Constraints Interaction

(Natives) /CVC.CV.'CV:C/	MAXμ	DEP μ	NON-FINALITY σ
✓CVC.CV. 'CV:C			*
CVC. 'CV:. CVC	*!	*	
(Learners) /CVC.CV.'CV:C/	NON-FINALITY σ	MAXμ	DEP μ
CVC.CV. 'CV:C	*!		
✓CVC. 'CV:. CVC		*	*

6.5.3.6 **Parameterisation of Constraints**

Some constraints are parameterised in the grammar of one group but not in the grammar of the other. For example, the WSP is parameterised in the native speakers' grammar but its requirement is consistent in the learners' grammar. The performance of the native speakers shows that the WSP is parameterised as WSP and WSP μμμ to account for stress assignment on heavy as well as superheavy syllables. The native speakers tolerate the violation of WSP but not the violation of WSP μμμ, consequently WSP μμμ dominates WSP; the opposite applies to the learners where the violation of WSP μμμ is tolerated but the violation of WSP is not. In fact, this finding does not comply with all the patterns of the learners' L1 as the violation of WSP is only accepted in unpredictable patterns in English and the obedience of WSP μμμ is also required in unpredictable patterns in English. These two constraints are treated differently so perhaps they are independent constraints. Another constraint is PARSE which is also parameterised by the native speakers into PARSE SYLLABLE and PARSE SEGMENT but they are not independent from each other. They require syllables and segments to be part of a foot but they also occupy the same level of ranking with no dominant relation. However, the performance of the learners does not indicate that PARSE SEGMENT is active and it shows that the learners activate only PARSE SYLLABLE or in other words, the learners does not violate PARSE SEGMENT in their grammar.

The NON-FINALITY σ is parameterised in the learners' grammar but its requirement is consistent in the native speakers' grammar. The performance of the learners shows that NON-FINALITY σ strictly applies to nouns so the learners parameterise this constraint as NON-FINALITY σ NOUN in accordance with their L1, while the native speakers do not restrict it to a grammatical category. Rather, it generally applies to any grammatical category.

6.5.3.7 **Agreement on Trochaic, PARSE σ and SWP**

There are constraints that are ranked at the same level and hold the same dominance relation in both groups. TROCHEE is highly ranked in both languages and clearly surfaces in the production of the learners as well as the native speakers; moreover, TROCHEE is not violated and is a dominant constraint. SWP is another constraint that is ranked lower by both groups and can be violated. The PARSE σ constraint dominates directionality constraints and faithfulness constraints based on the grammar of the group. The PARSE σ constraint is very crucial as its violation satisfies other dominant and sometime non-violated constraints.

6.5.3.8 **Activity of Constraints**

How we can decide in a certain language or interlanguage whether a constraint is active? Optimality Theory hosts a large set of constraints that should be universal in nature and available in all languages. The dominance hierarchy differs from one language to another or from one grammar to another. This hierarchy filters the activity and dominance of the constraints. However, if constraints are not required to derive a certain pattern in a grammar of a certain group, such as some syllabic constraints SSP>> SYLL-ALIGN-L>> *'V>> REDUCE. However, whether a constraint is active or not can be determined by its role in the ranking. For example, the impact of ALIGN LEFT constraint is not noticeable in either English or Arabic languages, but because constraints are universal and their effectiveness depends on the level of their ranking, ALIGN LEFT is found to be more noticeable and active in the production of some learners as it is ranked more highly.

However, there is still a problem of the hidden structure that is not recognised by the learners as they deal with the surface structure. The generated candidates that resemble the surface structure do not violate some of the constraints which are responsible for deriving them (surface structures). For example (Tableau 6.59), the syllabic constraints SSP and SYLL-ALIGN-L are not violated by the optimal output. Regardless of the level of the ranking of REDUCE, it is violated twice by all the candidates. However, *'V violates the optimal output produced by the learners and for this reason it should be demoted in the learners' interlanguage, in contrast to the native speakers, in order to ban stress on an epenthetic vowel.

Tableau 6.59: Vowel Insertion

‘CV.CVC.CV	SSP	SYLL-ALIGN-L	REDUCE	FT-BIN	NON-FIN σ	R-MOST	PARSE σ	*‘V
‘(CV).(C**V**C).<CV>			**	*!		**		
✓CV. ‘(C**V**C).<CV>			**			*		*
CV.(C**V**C). (‘CV)			**		* !			

Are the syllabic constraints SSP and SYLL-ALIGN-L active in the learners' interlanguage? It seems that their ranking is not essential in deriving stress as they are not responsible for assigning stress to the surface structure of words. The learners will not be able to learn the hidden structure of the surface structure until they recognise the grammar of the infrastructure of the words (Tesar and Smolensky 1998). This is difficult to achieve in naturalistic acquisition with no formal or directed instructions.

In this chapter, I developed a constraint ranking that governs the native speakers and the learners' production and I showed how the learners demoted some constraints in their production. I also shed light on how predictable patterns are easily applied in L2, while the unpredictable patterns are sometimes unreachable. I showed that learners might not resort to either the L1 or L2 and reset their patterns. L1 transfer has also an impact on the learners' production. In the next chapter, I will present the results of the perception task followed by a discussion chapter.

7 Chapter Seven: Perception Results

7.1 Introduction

I will present the results of the identification task in this chapter. Similar to Chapter 5, the results of the English-speaking learners group will be described followed by the results of the native speakers of LA. In the last section, I will discuss whether there is an effect of syllable position on correctness of perception and whether there is an interaction between closure/openness of syllables and stress on one hand, and vowel quality and stress on the other hand when it comes to perception accuracy.

7.2 English-Speaking Learners of LA: Identification Task

7.2.1 Phonologically Conditioned Patterns: Trisyllabic Words

7.2.1.1 **CV.cv.cv Pattern (1)**
/ˈʃarika/, /ˈsamaka/, /ˈmariga/

Table 7.1: The Learner Perception Results for Pattern (1)

CV.cv.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	27	**60%**	**Correct**	50.7	.0	100
Penultimate	15	18	40%	Incorrect	50.7	.0	100

The learners identified the correct stress in the majority of their responses. The participant perceived the correct assignment in 60% of items. The errors involved 40% of items with stress being placed on the penultimate syllable. No participant chose the ultimate syllable as the stressed syllable. Despite the difference in the mean percentages, the non-parametric test showed that this difference was non-significant (Chi Square = 0.60, (p= 0.439). So to some extent, the learners perceived the stress position in this pattern. In the production results, the learners produced the antepenultimate syllable with stress more than the other syllables. First, this is expected as the antepenultimate syllable is the correct landing site for stress. Second, this might imply a relationship between production and perception as the majority of instances were produced and perceived with a stress on the antepenultimate syllable- this supports H3-1 (see section 4.2.1.1).

7.2.1.2 **Cvc.CVC.cvc Pattern (2)**
/mid.'zaw.wiʒ/, /mid.'bah.dil/, /mis.'taw.Sif/, /mit.'ʕaf.lig/, /mus.'taq.bil/

Table 7.2: The Learner Perception Results for Pattern (2)

cvc.CVC.cvc	N	Responses	Mean%	Accuracy	Std. D	Min	Max
Antepenultimate	15	30	40%	Incorrect	39.3	.0	100
Penultimate	15	41	**54.7%**	**Correct**	38.9	.0	100
Ultimate	15	4	5.3%	Incorrect	15.9	.0	60

The participants identified the correct position of stress in 54.7% of items. The errors occurred when participants chose the antepenultimate syllable more than choosing the ultimate one. The overall difference was significant (Chi Square = 9.77, p = 0.008). However, after applying a pair-wise test, it confirms that the difference between the number of responses which chose the antepenultimate and the penultimate syllables was not significant (Chi Square = 0.28, p = 0.593). On the contrary, the difference between the antepenultimate and ultimate syllable and the penultimate and ultimate syllable was significant (Chi Square = 4.45, p = 0.035; and Chi Square = 9.30, p = 0.002 respectively). This shows that the learners were determined to exclude the ultimate syllable, but not very sure when it came to deciding between the antepenultimate and penultimate syllables. Comparing the production results, the learners were more accurate on perception, as the majority of responses correctly involved the penultimate syllable, whereas the majority of instances were incorrectly produced with antepenultimate stress in the production task. In this pattern, there is no evidence that there is a relationship between perception and production, because the learners do not produce what they perceived to be a stressed syllable. It seems that this performance does not support H3.

7.2.1.3 **Cvc.CVC.cv Pattern (3)** **/mus.'taʃ.fa/, / mux.'til.fa/, /mix.'tim.ra/**

Table 7.3: The Learner Perception Results for Pattern (3)

cvc.CVC.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	6	13.3%	Incorrect	35.2	0	100
Penultimate	15	39	**86.7%**	**Correct**	35.2	0	100

The participants were successful in locating the correct stress bearing syllable in the majority of cases. They only failed in 6 items, where they chose the antepenultimate syllable as the stress landing site. The ultimate syllable was not selected by the participants at all in this pattern. The results of the Friedman test showed that there was a significant result (Chi Square = 8.06, p = 0.005). This shows that the learners did not treat the syllables equally but rather showed a preference towards the penultimate one. There is also agreement between the perception and production of stress location, as the majority of items are produced with penultimate stress and the majority of responses involved perceiving the penultimate syllable as the stressed one in the perception task. This is in contrast to pattern (2) where the learners produced and perceived stress at the different positions in the majority of their responses. This is a potential support to H3-1.

7.2.1.4 cv.CVC.cvc Pattern (4)
/mu'handis/, /ʕa'bamber/, /mu'darris/

Table 7.4: The Learner Perception Results for Pattern (4)

cv.CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	9	20.%	Incorrect	37.4	.0	100
Penultimate	15	36	**80.%**	**Correct**	37.4	.0	100

The learners correctly recognized the prominence of the penultimate syllable in 80% of their choices. The participants only incorrectly involved the antepenultimate syllable; the ultimate syllable was never chosen. Once more, the result of the non-parametric test was significant (Chi Square = 5.40, p = 0.020) which confirms that the learners extensively perceived the penultimate syllable as the stress bearer. Moreover, looking at the production results, the learners also produced the items with stress assigned on the penultimate syllable which possibly implies a connection between the perception and production in the learners' grammar and a support to H3-1.

7.2.1.5 CV.cvc.cv Pattern (5)
/'mazirʕa/, /'madirsa/, /'makinsa/, /'makitba/, /'basimta/

Table 6.5: The Learner Perception Results for Pattern (5)

CV.cvc.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	22	**29.3%**	**Correct**	44.6	.0	100
Penultimate	15	53	70.7%	Incorrect	44.6	.0	100

In contrast to the previous pattern, the learners incorrectly perceived the penultimate syllable as the stress bearer in 70.7% of the items. Surprisingly, the learners correctly identified the antepenultimate syllable in just 29.3% of items. The participants did not select the ultimate syllable at all. The statistical test tentatively supported the fact that the learners perceived the penultimate syllable more frequently because the result was marginally significant (Chi Square = 3.267, p = 0.071). Interestingly enough, the learners also incorrectly produced this pattern with stress assigned on the penultimate syllable, the same syllable that they produced bore stress in the perception task. This might suggest that production and perception of stress are possibly related to each other. In other words, the learners produced what they perceived but they performed better in the perception task. There is a slight support to H3-2.

7.2.1.6 **CV.cvc.cvc Pattern (6)**
/'ka.biʃ.kum/, /'ma.lik.hum/, /'ga.bil.kum/

Table 7.6: The Learner Perception Results for Pattern (6)

CV.cvc.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	13	**28. 9%**	**Correct**	45.2	.0	100
Penultimate	15	32	71.1%	Incorrect	45.2	.0	100

The majority of responses made by the learners were incorrectly attributed to the penultimate syllable. The learners correctly perceived around 28.9% of items with stress on the antepenultimate syllable, while the ultimate position was not ever chosen by the participants. The result of the Friedman test approached significance (Chi Square = 3.26, p = 0.071) which suggests that the learners were, to some extent, sure about their choices. Similar to the results seen in pattern (5), stress perception and stress production matches, whereby the learners incorrectly perceived and produced the penultimate syllable as the stress holder in the majority of their responses supporting H3-2.

7.2.1.7 **cv.CVː.cv Pattern (7)**
/ru'zaːtˤa/, /ʃi'baːni/, /ʕi'maːra/

Table 7.7: The Learner Perception Results for Pattern (7)

cv.CVː.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	15	33.3%	Incorrect	48.8	.0	100
Penultimate	15	30	**66.7%**	**Correct**	48.8	.0	100

The learners correctly perceived the penultimate syllable stress bearer in the majority of responses. Only the antepenultimate syllable was incorrectly perceived to bear stress and stress was never perceived on the ultimate syllable, as shown in the table above. There was not a vast difference between the responses given to the antepenultimate and penultimate syllables, confirmed by the non-significant result in the Friedman Test (Chi Square = 1.66, p = 0.197), indicating that the preference towards the penultimate syllable was not a strong one. Recalling the production results, the choices made by the learners in perception converges with those in the production task supporting H3-1.

7.2.1.8 **cvc.CVː.cv Pattern (8)**
/sfan'naːri/, /dar'buːka/, /ʃig'gaːga/, /gar'ʒuːma/, / xan'fuːsa/

Table 7.8: The Learner Perception Results for Pattern (8)

cvc.CVː.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	18	24%	Incorrect	33.9	.0	100
Penultimate	15	56	**74.7%**	**Correct**	33.4	.0	100
Ultimate	15	1	1.3%	Incorrect	5.2	.0	20

The penultimate syllable was the most selected syllable by the learners, in 74.7% of items. The second most common syllable was the antepenultimate one. The ultimate syllable was hardly selected as a stress bearer. The overall score was significant (Chi Square = 16.19, p <0.001). Therefore, a pair-wise test was conducted to investigate the nature of this difference further. The difference between the antepenultimate and penultimate syllables approached significance (Chi Square = 3.267, p = 0.071). The difference between the antepenultimate and the ultimate syllables was significant (Chi Square = 4.50, p = 0.034). The difference between the penultimate and ultimate syllables was highly significant (Chi Square =14.0, p< 0.001). This supports the hypothesis that the learners correctly favoured the penultimate syllable over the other positions. In parallel to the previous patterns, a link between production and perception is to some extent consistent with the results, because the performance of the learners in the production task is compatible with those of the perception task in which the penultimate syllable is selected as the stress bearer.

7.2.1.9 **cvc.cv.CVːC Pattern (9)**
/buk ki 'ʃaːʃ/, /manda'liːn/, /fir ħa 'niːn/

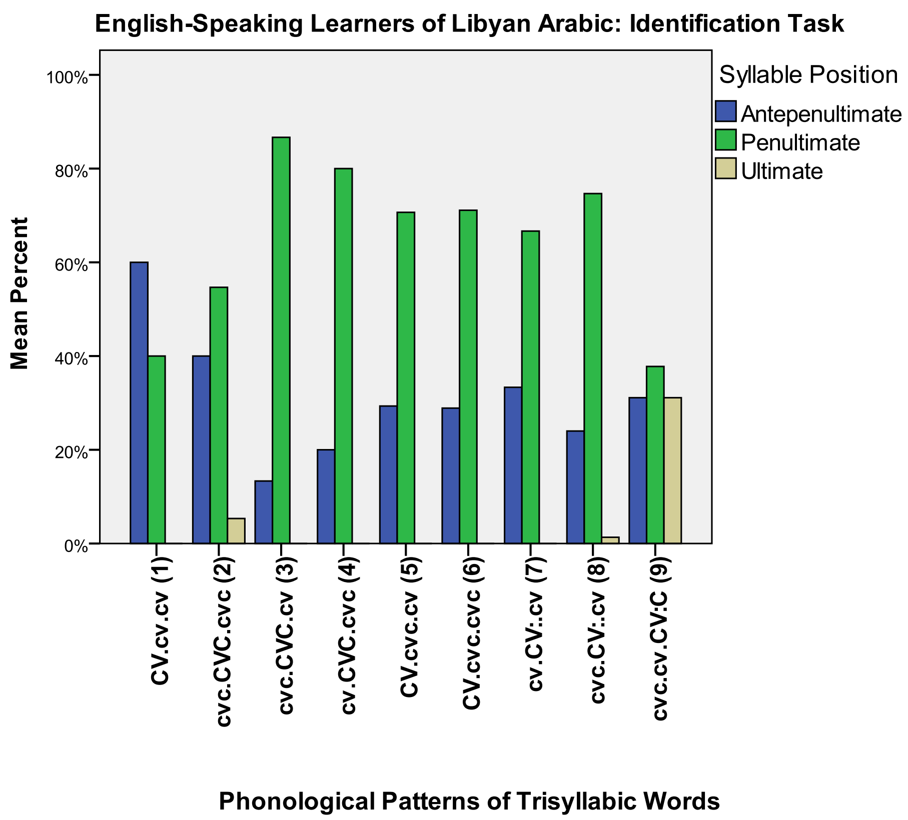
Table 7.9: The Learner Perception Results for Pattern (9)

cvc.cv.CV:C	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	14	31.1%	Incorrect	32.03	.0	100
Penultimate	15	17	37.8%	Incorrect	30.5	.0	100
Ultimate	15	14	**31.1%**	**Correct**	36.6	.0	100

This pattern elicited an interesting result, as the learners did not show an obvious preference. Both the antepenultimate and ultimate syllables were selected, and the responses were equally distributed as can be seen in the table above. The penultimate syllable was incorrectly selected in 37.8% of cases. The result of the statistical test showed that the learners did not favour any particular syllable. This observation was supported by an insignificant result (Chi Square = 0.87, p = 0.646). Comparing production to perception, the performance in this pattern does not match in the tasks, as the learners do not produce what they perceived as the stress bearer. In the production task, the nominated syllable was the antepenultimate syllable, while in the perception task, the most commonly chosen syllable was the penultimate one. It seems that the participants were unsure of where the stress should be placed supporting H3-2.

7.2.1.10 **Summary of Learner Results for Trisyllabic Word Perception**

Figure 7.1: Phonologically Conditioned Stress Patterns of Trisyllabic Words in Learner Perception



The figure above shows that the penultimate syllable was the most frequently selected syllable in the majority of patterns, regardless of correctness. Exceptionally, the antepenultimate syllable was chosen more often in pattern (1). Apart from patterns (2), (8) and (9), the ultimate syllable was not chosen as a stress bearer by the participants. The penultimate syllable was inaccurately perceived as the stress landing site in patterns

(5) and (6). There was agreement in the selection of the syllable holding stress in perception and production tasks in patterns (1), (3), (4), (5), (6), (7) and (8); however, there were two patterns namely pattern (2) and (9) where the items produced and the stress positions selected by the learners were not in agreement. In other words, they did not produce what they perceived.

7.2.2 Phonologically Conditioned Patterns: Disyllabic Words

7.2.2.1 **cv.CVːC Pattern (10)**
/fla'liːs/, /ki'saːn/, /ɣa'fiːr/

Table 7.10: The Learner Perception Results for Pattern (10)

cv.CV:C	N	Responses	Mean %t	Accuracy	Std. D	Min	Max
Penultimate	15	18	40 %	Incorrect	42.2	.0	100
Ultimate	15	27	**60%**	**Correct**	42.2	.0	100

The participants selected the ultimate syllable more than the penultimate one. However, there was no major difference between the instances assigned to each syllable. This results in insignificant result (Chi Square = 1.66, p = 0.197). Although the mean percent showed that the learners preferred the ultimate, the difference in the mean percent was not recognized by the statistical test. The instances produced in the previous task and the items selected in the current task were slightly different so there is no evidence for or against there being agreement between the tasks with slight support to H3-2.

7.2.2.2 **CV.cvc Pattern (11)**
/'muriʃ/, /'ruʃin/, /'ħabil/

Table 7.11: The Learner Perception Results for Pattern (11)

CV.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	18	**40%**	**Correct**	42.2	.0	100
Ultimate	15	27	60%	Incorrect	42.2	.0	100

The participants incorrectly chose the ultimate syllable in the majority of their responses. The penultimate syllable was selected as the stress bearer in 40% of the items. Similar to the previous pattern, the results of Freidman test showed that this difference was insignificant (Chi Square = 1.66, p = 0.197). Similar to pattern (10), the choices made in the perception task are slightly different from the responses found in the production task.

7.2.2.3 **cv.CVC Pattern (12)**
/ma'ħal/, /ʃi'jar/, /ma'mar/

Table 7.12: The Learner Perception Results for Pattern (12)

cv.CVC	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	16	35.6%	Incorrect	42. 7	.0	100
Ultimate	15	29	**64.4%**	**Correct**	42. 7	0	100

The learners accurately placed stress on the ultimate syllable more frequently than the penultimate one. The penultimate syllable was incorrectly selected in 35.6% of the items. The result of the non-parametric test was very close to the significant level, giving a value of Chi Square = 3.26, (p = 0.071). Comparing this task to the production task, there is noticeable agreement in selecting and producing the ultimate syllable as the stress bearer which may possibly be taken as an indication that learners produced what they perceived as a stressed syllable. Moreover, their choices were accurate in this pattern with a support to H2.

7.2.2.4 **CV.cv Pattern (13)**
/'ɣaba/, /'lutˤa/, /'tˤawa/, /'bala/

Table 7.13: The Learner Perception Results for Pattern (13)

CV.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	53	**88.3%**	**Correct**	26.5	.0	100
Ultimate	15	7	11.7%	Incorrect	26.5	.0	100

The learners correctly perceived the stress on the penultimate syllable in 88.3% of cases. Just few errors occurred, when the learners selected the ultimate syllable as the one carrying the stress. In this pattern, the learners preferred the penultimate syllable and this numerical trend was supported by the significant result of the Friedman test, (Chi Square value = 11.26, p = 0.001). It is evident that the learners did not treat the positions equally. Another link between production and perception is found in this pattern. The choices are compatible in both tasks, promoting the penultimate syllable as the stress holder supporting H3-1.

7.2.2.5 **CVC.cvc Pattern (14)**
/'filfil/, /'maktib/, /'maxzin/, /'mafriʃ/

Table 7.14: The Learner Perception Results for Pattern (14)

CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	51	**85%**	**Correct**	18.4	50	100
Ultimate	15	9	15%	Incorrect	18.4	.0	50

The performance in the current pattern was indistinguishable from the previous one. The learners correctly identified stress on the penultimate syllable in 85% of the items. In a few cases, the learners located stress on the ultimate syllable. The outcome of conducting the Freidman test was highly significant (Chi Square = 13.00, p < 0.001) showing that learners favoured stress on the penultimate syllable. It can be noticed that there is a connection between perception and production in that the learners produced what they perceived as the stress bearer (H3-1).

7.2.2.6 CVC.cv Pattern (15)
/'ʃibka/, /'ʃarba/, /'ħufra/, /'bugra/

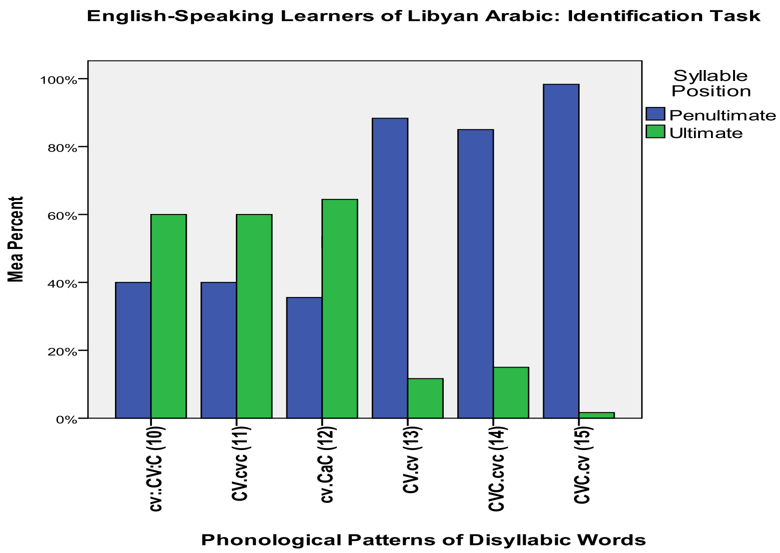
Tableau 7.15: The Learner Perception Results for Pattern (15)

CVC.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	59	**98.3%**	**Correct**	6.5	75.	100.
Ultimate	15	1	1.7%	Incorrect	6.5	.0	25.

The learners perceived the stress location in most, if not all, items. Only one single error was recorded. The result of the test was highly significant (Chi Square = 15.00, $p < 0.001$). This confirms that the learners preferred the penultimate over the ultimate syllable in this pattern. The production and the perception results match in this pattern (H3-1).

7.2.2.7 Summary of Learner Results for Disyllabic Word Perception

Figure 7.2: Phonologically Conditioned Stress Patterns of Disyllabic Words in Learner Perception



The figure above shows that the learners were not consistent in their choices of syllable that holds the stress. They showed a general tendency towards the ultimate in (12). On the contrary, the learners had a leaning towards the penultimate syllable in the patterns (13), (14) and (15). There was no significant difference between the responses given to the penultimate and ultimate syllables in patterns (10), (11) and (12), though pattern (12) elicited a marginally significant difference. On the other hand, where the actual stress location was the penultimate syllable, there was a huge difference in the responses allocated to each position in patterns (13), (14) and (15). Comparing perception task to production task, there is an agreement in selecting and producing the same stress position in patterns (12), (13), (14) and (15) but not in patterns (10) and (11).

7.2.3 Mixed Conditioned Patterns: Disyllabic Verbs

7.2.3.1 **CVC.cvc/cvc.CVC (Active/Passive) Pattern (16)**
/'niglib/- /nig'lab/, /'nuwlid/- /nuw'lad/, /'niktib /nik'tab/, /'nirsim/ nir'sam/

Table 7.16: The Learner Perception Results for Pattern (16)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std. D	Min	Max
Active Form	Penultimate	15	26	**43.3%**	**Correct**	43.8	.0	100
	Ultimate	15	34	56.7%	Incorrect	43.8	.0	100
Passive Form	Penultimate	15	16	26.7%	Incorrect	42.7	.0	100
	Ultimate	15	44	**73.3%**	**Correct**	42.7	.0	100

In the active form, the learners inaccurately perceived stress on the ultimate syllable in 56.7% of items. Only 43.3% of items were correctly identified with penultimate stress. In contrast, the ultimate syllable was correctly selected as a stress bearer more than the penultimate syllable in the passive form. Errors occurred in 16 items where the learners chose the penultimate syllables. The result was not significant in the active form (Chi Square = 0.28, p = 0.593) while it was close to the significant level in the passive (Chi

Square = 3.26, p = 0.071). This indicates that the learners were undecided in their performance in the active, while they displayed an element of determination in their choices in the passive.

7.2.3.2 **CVC.cvc/cvc.CVCC (1st and 3rd Person, Past, masculine) Pattern (17) /'baddil/-/bad'dilt/, /'fakkir/-/fak'kirt/, /'kassir/-/kas'sirt/**

Tableau 7.17: The Learner Perception Results for Pattern (17)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std. D	Min	Max
Past Form	Penultimate	15	16	**35.6%**	**Correct**	44.5	.0	100
3rd person	Ultimate	15	29	64.4%	Incorrect	44.5	.0	100
Past Form	Penultimate	15	11	24.4%	Incorrect	40.7	.0	100
1st person	Ultimate	15	34	**75.6%**	**Correct**	40.7	.0	100

Once more, the learners incorrectly perceived the ultimate syllable as the stress holder in 64.4% of cases. However, in 35.6% of items, the learners correctly selected the penultimate syllable. In the past 1st person form, the majority of responses were given to the ultimate syllable, the actual stress location. The errors occurred when the learners perceived the penultimate syllable to be stressed (24.4% of items). A Friedman test, revealed that the result of the past 3rd person form was not significant (Chi Square = 1.66, p = .197) but the result of the past 1st person form was significant (Chi Square = 5.40, p = .020). This means that the learners make a clearer decision about their choices in the 1st form compared to their choices in the 3rd person form. The ultimate syllable was chosen more often by the learners in production and perception in both forms. Regardless of correctness, it seems the learners produced what they perceived in this pattern.

7.2.3.3 CVC.cvc/cvc.CVC Imperative/ 3rd Masc Past Pattern (18) /'(ʔ)albis/-/(ʔ)il'bas/, /'(ʔ)azʕil/-/(ʔ)iz'ʕal/, /' (ʔ)aftaħ/-/ʔif'taħ/, /'(ʔ)amsaħ/-/(ʔ)im'saħ/

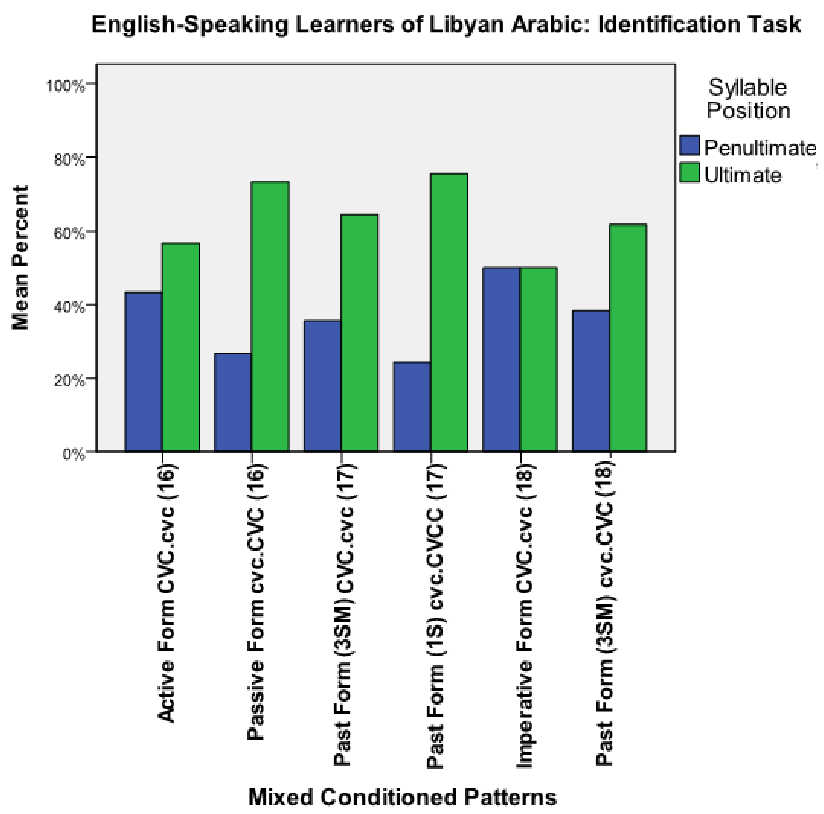
Table 7.18: The Learner Perception results for Pattern (18)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std. D	Min	Max
Imperative Form	Penultimate	15	30	**50%**	**Correct**	42.3	.0	100
	Ultimate	15	30	50%	Incorrect	42.3	.0	100
Past (3G) Form	Penultimate	15	23	38.3%	Incorrect	41.04	.0	100
	Ultimate	15	37	**617%**	**Correct**	41.04	.0	100

The number of responses allocated to the penultimate and ultimate syllables in the imperative form was exactly the same. The learners did not show any preference for either syllable. A Friedman test showed the difference between these positions to be insignificant (Chi Square = 0.07, p = 0.782). In the past form, the learners correctly perceived stress on the ultimate syllable in 61.7% of the items. The errors involved 38.3% of the items when the learners selected the penultimate syllables as the stress bearer. The number of instances in each syllable was not equal but it was not significant (Chi Square = 1.14, p = 0.285). One can claim that there is possibly a match between perception and production in which the ultimate was selected more often in past form and the learners were undecided in both tasks when it comes to the imperative form.

7.2.3.4 Summary of Learner Perception of Mixed Conditioned Patterns

Figure 7.3: Mixed Conditioned Stress Patterns of Disyllabic Verb forms



The figure above shows that the learners selected the final syllable more than the penultimate in verbs. However, the learners showed steadier performance where the actual stress location was the ultimate. In passive (in pattern 16) and past 1st person form (in pattern 17), the significant results obtained supported the fact that the learners were less hesitated in choosing the stress placement when the actual stress land on the ultimate syllable. Where the actual stress holder was the penultimate, the learners were not decided enough and showed hesitation in choosing the stress location. That can be recognised in the equal number of responses in the imperative form as well as the insignificant result in the active pattern. In terms of the production and perception relationship, the learners produced what they perceived in pattern (17) in both subcategories, in pattern (16), the passive form and in pattern (18), the past 3rd person form. The performance provides a support to H3-3.

7.3 Native Speakers of LA: Identification Task

This section presents the performance of the native speakers in the identification task. Following the same order, the phonological patterns of trisyllabic and disyllabic words will be presented, followed by the mixed conditioned patterns. Unexpectedly, the native speakers fail on various occasions to locate stress in the attested words. This performance indicates that the notion of stress is totally abstract and it is not necessarily the case that speakers can perceive what they produce, even in their mother tongue. At first glance, one might think that this is completely unanticipated but in fact other studies have also found that stress is not easily perceived in either the mother tongue or the L2 (Taylor and Hellmuth 2012; Kijak 2009).

7.3.1 Phonologically Conditioned Patterns: Trisyllabic Words

7.3.1.1 **CV.cv.cv Pattern (1)**
/'ʃarika/, /'samaka/, /'mariga/

Table 7.19: The Native Speaker Perception Results for Pattern (1)

CV.cv.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	15	**33.%**	**Correct**	48.8	.0	100
Penultimate	15	15	33.3%	Incorrect	48.8	.0	100
Ultimate	15	15	33.3%	Incorrect	48.8	.0	100

The native speakers of Libyan Arabic failed to identify and to perceive the syllable bearing the stress in this pattern. Unexpectedly, the three syllables were equally perceived as being stressed. This indicates that the natives have no preference and all syllable positions are treated equally by them when it comes to perception. Comparing it to the production task, the participants achieved a ceiling effect, producing all items with antepenultimate stress. There is no doubt that the result of the statistical test was highly insignificant (Chi Square = 0.00, p = 1).

7.3.1.2 **cvc.CVC.cvc Pattern (2)**
/mid.'zaw.wiʒ/, /mid.'bah.dil/, /mis.'taw.Sif/, /mit.'ʕaf.lig/, /mus.'taq.bil/

Table 7.20: The Native Speaker Perception Results for Pattern (2)

cvc.CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	2	2.7%	Incorrect	10.3	.0	40.0
Penultimate	15	55	**73.3%**	**Correct**	30.9	.0	100.0
Ultimate	15	18	24%	Incorrect	29.5	.0	100.0

The natives did not achieve 100% accuracy in perceiving the actual stress placement in this pattern, but the majority of responses were given to the penultimate syllable. Errors involved choosing the antepenultimate syllable twice and the ultimate one in 24% of the items. The overall difference among the number of cases given to the three positions was highly significant (Chi Square = 18.86, p < 0.001). A pair-wise comparison test was conducted to confirm the significance of the difference between instances allocated to the antepenultimate and penultimate syllables (p < 0.001), between the antepenultimate and ultimate syllables (p = 0.034) and between the penultimate and the ultimate syllables (p = .005). The native speakers accurately favoured the penultimate syllable. This means they actually produced what they perceived as the stressed syllable.

7.3.1.3 **Cvc.CVC.cv Pattern (3)**
/mus.'taʃ.fa/, / mux.'til.fa/, /mix.'tim.ra/

Table 7.21: The Native Speaker Perception Results for Pattern (3)

cvc.CVC.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	6	13.3%	Incorrect	35.2	0	100
Penultimate	15	39	**86.7%**	**Correct**	35.2	0	100
Ultimate	15	0	.0%	Incorrect	.0	.0	.0

The performance was slightly improved in this pattern, when the natives accurately selected the penultimate syllable in 86.7% of items. The errors involved the antepenultimate syllable in 13.3% of items. The ultimate was not selected by the participants at all. The result of the Friedman test was significant (Chi Square = 8.067, p = 0.005). Statistically, this means that the native speakers preferred the penultimate syllable. Although they did not reach the top limit in perception as they did in production, the penultimate syllable was chosen in the majority of instances and this matches the performance in production.

7.3.1.4 **cv.CVC.cvc Patttern (4)**
/mu'handis/, /ʕa'bamber/, /mu'darris/

Table 7.22: The Native Speaker Perception Results for Pattern (4)

cv.CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	2	4.4	Incorrect	11.7	.0	33.3
Penultimate	15	43	**95.6%**	**Correct**	11.7	66.7	100.0
Ultimate	15	0	0%	Incorrect	.0	.0	.0

The native speakers correctly perceived the penultimate syllable as the one bearing stress in 95. 6% of cases. Only two items were misperceived by the participants. Similar to the above pattern, the ultimate was never chosen. The result of the statistical test shows that the difference between the choices made by the participants was significant (Chi Square

= 15.000, p < 0.001). This means that the native speakers were confident about their choices and performed successfully in this pattern; therefore, one might claim that production is linked to perception in this pattern.

7.3.1.5 **CV.cvc.cv Patten (5)**
/'mazirʕa/, /'madirsa/, /'makinsa/, /'makitba/, /'basimta/

Table 7.23: The Native Speaker Perception Results for Pattern (5)

CV.cvc.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	3	**4.%**	**Correct**	15.5	.0	60.0
Penultimate	15	72	96.%	Incorrect	15.5	40.0	100.0
Ultimate	15	0	.0%	Incorrect	0	.0	.0

The native speakers misperceived the majority of the items, by incorrectly selecting the penultimate syllable. Only three instances were accurately perceived; as usual, the ultimate syllable was never selected. Once more, the statistical result was highly significant (Chi Square = 11.26, p = 0.001). In fact, the native speakers did not treat the syllables equally, but they instead inaccurately favoured the penultimate one. In this pattern, the native speakers did not produce what they perceived, as they produced this pattern with antepenultimate stress and perceived it with penultimate stress.

7.3.1.6 **CV.cvc.cvc Pattern (6)**
/'ka.biʃ.kum/, /'ma.lik.hum/, /'ga.bil.kum/

Table 7.24: The Native Speaker Perception Results for Pattern (6)

CV.cvc.cvc	N	Responses	Mean%	Accuracy	Std. D	Min	Max
Antepenultimate	15	0	**.0%**	**Correct**	.0	.0	0
Penultimate	15	45	100%	Incorrect	.0	100	100.
Ultimate	15	0	.0%	Incorrect	.0	.0	.0

The native speakers performed unsuccessfully in this pattern because the penultimate syllable was selected as the stress bearer in all the items. The antepenultimate and the ultimate syllable were not chosen at all. As a result of the ceiling effect, no further statistical test is required. This patterns suggest that accurate production does not imply accurate perception. The different responses obtained from the production and perception tasks suggests that there is no link between the performances in the two tasks.

7.3.1.7 **cv.CVː.cv Pattern (7)**
/ru'zaːtˤa/, /ʃi'baːni/, /ʕi'maːra/

Table 7.25: The Native Speaker Perception Results for Pattern (7)

cv.CVː.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	0	0%	Incorrect	0	.0	.0
Penultimate	15	45	**100%**	**Correct**	0	100	100
Ultimat	15	0	.00%	Incorrect	0	.0	.0

The participants correctly perceived the location of the stressed syllable in this pattern as not a single error was recorded. The 100% accuracy blocked the application of statistical tests. However, the native speakers clearly showed a preference for the penultimate syllable. In this pattern, they produced what they perceived as the stressed syllable.

7.3.1.8 **cvc.CVː.cv Pattern (8)**
/sfan'naːri/, /dar'buːka/, /ʃig'gaːga/, /gar'ʒːma/, / xan'fuːsa/

Table 7.26: The Native Speaker Perception Results for Pattern (8)

cvc.CVː.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	0	0%	Incorrect	.0	.0	.0
Penultimate	15	75	**100%**	**Correct**	.0	100	100
Ultimate	15	0	.0%	Incorrect	.0	.0	.0

Similar to the previous pattern, the native speakers identified the syllable that bears the stress correctly in all of the items. The antepenultimate and the ultimate syllables were excluded as options by the participants. Once more, the performance in production and the performance in perception matches, which implies that the cues in this pattern lead the native speakers to the actual stressed syllable.

7.3.1.9 **cvc.cv.CVːC Pattern (9)**
/buk ki 'ʃaːʃ/, /manda'liːn/, /fir ħa 'niːn/

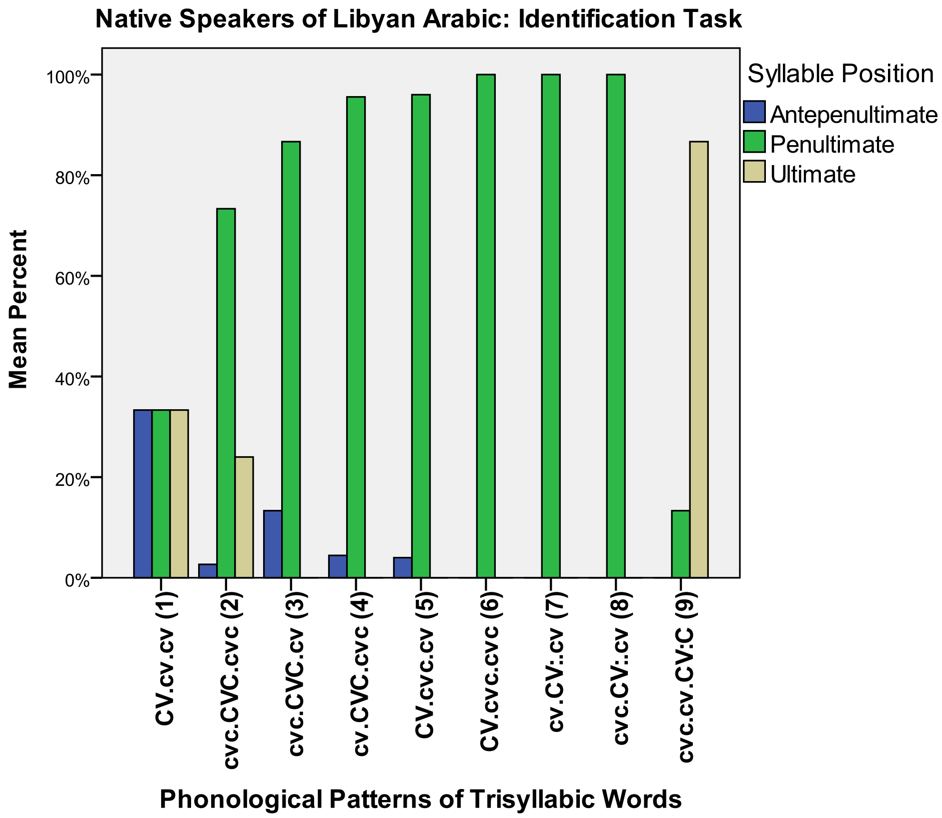
Table 7.27: The Native Speaker Perception Results for Pattern (9)

cvc.cv.CV:C	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Antepenultimate	15	0	.0	Incorrect	.0	.0	.0
Penultimate	15	6	13.3	Correct	35.2	.0	100
Ultimate	15	39	**86.7%**	**Correct**	35.2	.0	100

The natives correctly perceived the ultimate syllable as the one bearing stress in 86.667% of the items. However, errors occurred when the penultimate syllable was chosen in 6 items; the antepenultimate syllable was not perceived as a stress bearer at all. The difference between the number of items that received stress on the penultimate and the ultimate syllables was significant (Chi Square = 8.06, p = 0.005). This is an indication that the native speakers were determined about their choices to select the ultimate syllable as the stressed one. The participants did not perceive all the instances accurately, but the majority of responses were given to the actual stress bearer, the final syllable. To some extent the native speakers produced what they perceived as stressed syllable.

7.3.1.10 **Summary of Native Speaker Results for Trisyllabic Word Perception**

Figure 7.4: Phonologically Conditioned Stress Patterns of Trisyllabic Words in Native Speaker Perception



The figure above shows that the native speakers generally chose the penultimate syllable. However, this preference was not consistently accurate as the actual stress bearer was the antepenultimate syllable in patterns like (5) and (6). Poor performance can also be noticed in pattern (1) when the natives did not make a clear decision about their choices of the syllable that bears stress. This showed that even native speakers, who produce items in their mother tongue, were not able to locate the stress position in some patterns. The performance in pattern (2) was not hugely unsuccessful but the performance was far from reaching the ceiling; this might also indicate that the lack of obvious stress cues misled the natives in locating the stress. Pattern (1) and (2) have no length contrast and they are composed of balanced-weight syllables. The lack of more audible and structural cues in in the pattern might have contributed to the concealment of the prominence of the stress bearers. If this assumption is accurate, then, this element was probably the reason behind the poor performance in patterns (5) and (6) when the natives did not perceive the antepenultimate syllable as the stressed syllable and instead picked the penultimate one. There was an agreement between the responses in the production and perception task in patterns (2), (3), (4), (7), (8) and (9) but not in (1), (5) and (6).

7.3.2 Phonologically Conditioned Patterns: Disyllabic Words

7.3.2.1 cv.CVːC Pattern (10)
/fla'liːs/, /ki'saːn/, /ɣa'fiːr/

Table 7.28: The Native Speaker Perception Results for Pattern (10)

cv.CV:C	N	Responses	Mean %t	Accuracy	Std. D	Min	Max
Penultimate	15	6	13.3%	Incorrect	35.2	.0	100
Ultimate	15	39	**86.7%**	**Correct**	35.2	.0	100

The native speakers correctly identified the ultimate syllable as the stressed one in 86.7% of items. A few items were misperceived and the stress was located on the penultimate syllable. The difference between the numbers of the items allocated to each position was significant (Chi Square = 8.06, p = 0.005) which means that the native speakers favoured the ultimate syllable. The participants showed an agreement in this pattern and they both produced and perceived the ultimate syllable as the stress holder in the majority of their responses.

7.3.2.2 **CV.cvc Pattern (11)**
/'muriʃ/, /'ruʃin/, /'ħabil/

Table 7.29: The Native Speaker Perception Results for Pattern (11)

CV.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	7	15.6%	Incorrect	35.3	.0	100.
Ultimate	15	38	**84.4%**	**Correct**	35.3	.0	100.

The participants inaccurately selected the ultimate syllable as the stress holder in the majority of the items. The participants correctly perceived 7 items with stress on the penultimate syllable. The difference between the choices made by the native speakers was significant (Chi Square = 8.06, p = 0.005). The native speakers' perception was incorrect in this pattern. The responses recorded in the production task were not compatible with the responses received in the perception task. In the production task, the penultimate syllable was accurately produced but in the perception task the ultimate syllable is inaccurately selected.

7.3.2.3 **cv.CVC Pattern (12)**
/ma'ħal/, /ʃi'jar/, /ma'mar/

Table 7.30: The Native Speaker Perception Results for Pattern (12)

cv.CVC	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	6	13.3%	Incorrect	35.2	.0	100
Ultimate	15	39	**86.7%**	**Correct**	35.2	.0	100

Similar to pattern (11) above, the ultimate syllable was chosen as the stress carrier in the majority of the items. This time however, the participants' choice was accurate. A limited number of items were misperceived by the native speakers, who selected the penultimate syllable. A Friedman test was conducted, giving a significant result (Chi Square = 8.06, p = 0.005). Once more, the ultimate syllable was preferred over the penultimate one. As a result, the perception and the production task performances are in agreement.

7.3.2.4 **CV.cv Pattern (13)**
/ˈɣaba/, /ˈlutˤa/, /ˈtˤawa/, /ˈbala/

Table 7.31: The Native Speaker Perception Results for Pattern (13)

CV.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	60	**100%**	**Correct**	.0	100.	100
Ultimate	15	0	.0%	Incorrect	.0	.0	.0

In contrast to pattern (11), the participants correctly selected the penultimate syllable rather than the ultimate syllable. The native speakers reached 100% accuracy in identifying the syllable that holds stress. As a result of the ceiling effect, there was no need to conduct a Friedman test. The perception and the production tasks were both accurate and consequently we can say that the native speakers produced what they perceived to be the stress holder.

7.3.2.5 **CVC.cvc Pattern (14)**
/ˈfilfil/, /ˈmaktib/, /ˈmaxzin/, /ˈmafriʃ/

Table 7.32: The Native Speaker Perception Results for Pattern (14)

CVC.cvc	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	57	**95%**	**Correct**	14.1	50.0	100.0
Ultimate	15	3	5 %	Incorrect	14.1	.0	50.0

The participants accurately chose the penultimate syllable more frequently than the ultimate one. A scarce number of items were identified with ultimate stress. The figures in the table were supported by the highly significant result of the test (Chi Square = 14.00,

$p < 0.001$) which means that the participants statistically favoured the penultimate syllable more than the ultimate one, demonstrating a correlation between production and perception in this pattern.

7.3.2.6 **CVC.cv Pattern (15)**
/'ʃibka/, /'ʃarba/, /'ħufra/, /'bugra/

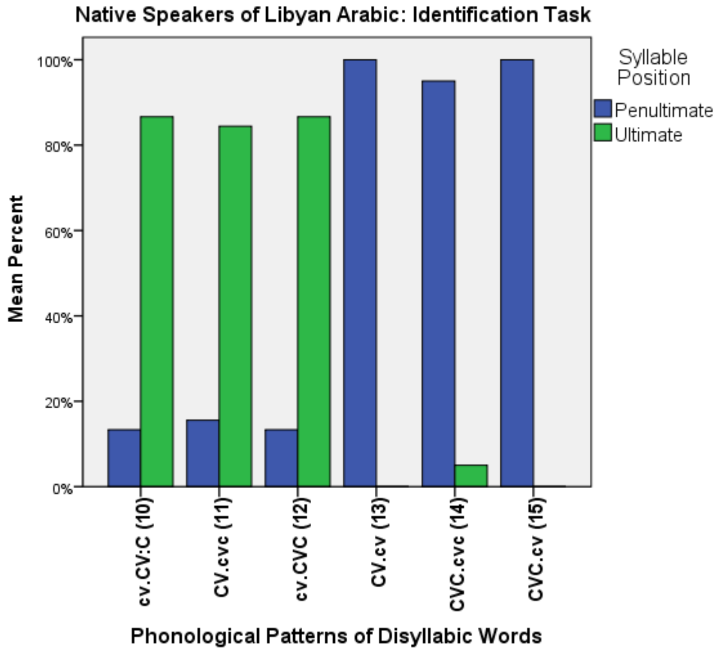
Table 7.33: The Native Speaker Perception Results for Pattern (15)

CVC.cv	N	Responses	Mean %	Accuracy	Std. D	Min	Max
Penultimate	15	60	**100%**	**Correct**	.0	100.	100
Ultimate	15	0	0%	Incorrect	.0	.0	.0

The participants reached the ceiling with 100% accuracy. All items were correctly identified with penultimate stress and the ultimate syllable was not perceived as the stress bearer at all in this pattern. No test was conducted due to the successful performance of the native speakers. The two tasks were both accurate and the native speakers produced what they perceived to be the stress holder in this pattern.

7.3.2.7 Summary of Native Speakers Results for Disyllabic Word Production

Figure 7.5: Phonologically Conditioned Stress Patterns of Disyllabic Words in Native Speaker Perception



The figure above shows that, regardless of correctness, the native speakers showed a general tendency towards the ultimate syllable in patterns (10), (11) and (12). However, the participants showed a tendency towards the penultimate syllable in patterns (13), (14) and (15). In terms of correctness, although the performance of the native speakers did not reach the ceiling in all the patterns, the performance was relatively high except in pattern (11) when the participants inaccurately perceived the ultimate syllable as the stress carrier. The native speakers were determined in their choices of the stressed syllable; this observation was supported by the results of tests. It seems the native speakers were able to locate stress in the majority of their responses but they failed to reach the top limit as they were supposed to be able to perceive their mother tongue. Production matches perception in all patterns except pattern (11). Perhaps the native speakers had a hard time locating stress that occurs in an open syllable with short vowel.

7.3.3 Mixed Conditioned Patterns: Disyllabic Verbs

7.3.3.1 CVC.cvc/cvc.CVC (Active/Passive) Pattern (16)

/'niglib/- /nig'lab/, /'nuwlid/- /nuw'lad/, /'niktib /nik'tab/, /'nirsim/ nir'sam/

Table 7.34: The Native Speaker Perception Results for Pattern (16)

Mixed Conditioned		N	Responses	Mean %t	Accuracy	Std. D	Min	Max
Active Form	Penultimate	15	55	**91.7%**	**Correct**	26.2	.0	100
	Ultimate	15	5	8.3%	Incorrect	26.2	.0	100
Passive Form	Penultimate	15	44	73.3%	Incorrect	45.8	.0	100
	Ultimate	15	16	**26.7%**	**Correct**	45.8	.0	100

In the active form, the participants correctly perceived the penultimate syllable as the stress holder. A few items were misperceived when the native speakers chose the ultimate syllable. The result of the test was significant (Chi Square = 11.267, p = 0.001) which means the participants preferred the penultimate syllable. The preference was inaccurately awarded to the penultimate syllable in the passive form. The result of the test was marginally significant (Chi Square = 3.267, p = 0.071). The ultimate was correctly picked up in just 26.7% of items. In the passive form, the native speakers did not produce what they perceived as they selected the penultimate syllable as the stress bearer in the perception task but they produced the passive forms with ultimate stress.

7.3.3.2 CVC.cvc/cvc.CVCC (1st and 3rd Person, Past, masculine) Pattern (17)

/'baddil/-/bad'dilt/, /'fakkir/-/fak'kirt/, /'kassir/-/kas'sirt/

Table 7.35: The Native Speaker Perception Results for Pattern (17)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std.D	Min	Max
Past Form 3rd person	Penultimate	15	15	**33.3%**	**Correct**	48.8	.0	100
	Ultimate	15	30	66.7%	Incorrect	48.8	0	100
Past Form 1st person	Penultimate	15	6	13.3%	Incorrect	35.2	0	100
	Ultimate	15	39	**86.7%**	**Correct**	35.2	.0	100

In this pattern, the participants chose the ultimate syllable more than the penultimate one in both subcategories. In the past 3rd person form, the ultimate syllable was incorrectly selected in 66.7% of items while in the past 1st person form; the ultimate syllable was accurately identified in 86.7% of items. When the participants misperceived the actual stress placement, the result of the statistical test was non-significant (Chi Square = 1.667, p = 0.197) showing that the native speakers were inconsistent in perceiving the stress location. However, when the native speakers correctly perceived the actual stress placement in the majority of the items, the result of the test was significant (Chi Square = 8.067, p = 0.005) supporting the fact that the participants were decided about choosing the ultimate syllable more often. In past 3rd person form, it seems that the perception and production tasks are disconnected as more responses were perceived with ultimate as opposite to the responses obtained from production. Whilst in the production task the participants chose the penultimate syllable, the perception task did not elicit a significant difference in the responses.

7.3.3.3 **CVC.cvc/cvc.CVCC (Imperative/3rd Masc Past) Pattern (18) /'(ʔ)albis/-/(ʔ)il'bas/, /'(ʔ)azʕil/-/(ʔ)iz'ʕal/, /'(ʔ)aftaħ/-/ʔif'taħ/,/'(ʔ)amsaħ/-/(ʔ)im'saħ/**

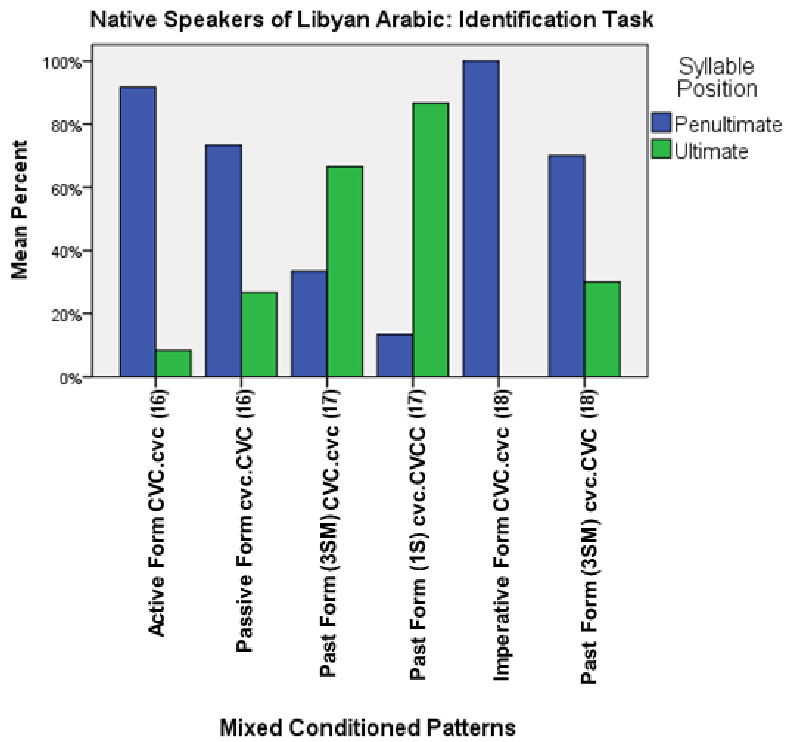
Table 7.36: The Native Speaker Perception Results for Pattern (18)

Mixed Conditioned		N	Responses	Mean %	Accuracy	Std. D	Min	Max
Imperative Form	Penultimate	15	60	**100%**	**Correct**	.0	100	100
	Ultimate	15	0	0%	Incorrect	.0	.0	.0
Past (3G) Form	Penultimate	15	42	70%	Incorrect	44.5	.0	100
	Ultimate	15	18	**30%**	**Correct**	44.5	.0	100

The native speakers reached the top limit in identifying the correct stress placement in the imperative form. Therefore, no further statistical tests were conducted. In the past form, the participants inaccurately perceived most of items with stress on the penultimate syllable. Just 30% of the instances were identified with correct stress placement on the ultimate syllable. The difference between the choices made in locating the stress in the penultimate or the ultimate syllable was marginally significant (Chi Square = 3.267, p = 0.071) which means that the participants showed a slight preference for the penultimate syllable but they were not strongly decided. In the imperative form, the items produced and the items perceived agree in having the penultimate syllable as the stress carrier but this does not apply to the past form, as no agreement was found between perception and production in the this form.

7.3.3.4 Summary of Native Speakers Perception of Mixed Conditioned Patterns

Figure 7.6: Mixed Conditioned Stress Patterns of Disyllabic Verb forms



The figure above shows that the native speakers selected the penultimate syllable more frequently in patterns (16) and (18), but they showed a tendency towards the ultimate syllable in pattern (17). This intriguing result is difficult to explain. However, when the participants misperceived the actual stress location, the results of the statistical tests were nonsignificant (in the past 3rd person form of pattern 17) or only marginally significant (in the passive form of pattern 16), and (the past 3rd person form of pattern 18). This indicates that the participants were inconsistent, but when they accurately locate the stress position, the results of the statistical tests were significant, supporting the fact that they were consistent. In terms of the perception and production relationship, the native speakers did not produce what they perceived in a number of patterns, namely the passive form and the 3rd person past form. This can be taken as evidence which supports Kijak (2009) and Altmann (2006), who argue that perception and production do not have a constant relationship in suprasegmental representation, as opposed to segmental representation, which implies that perception might lead production.

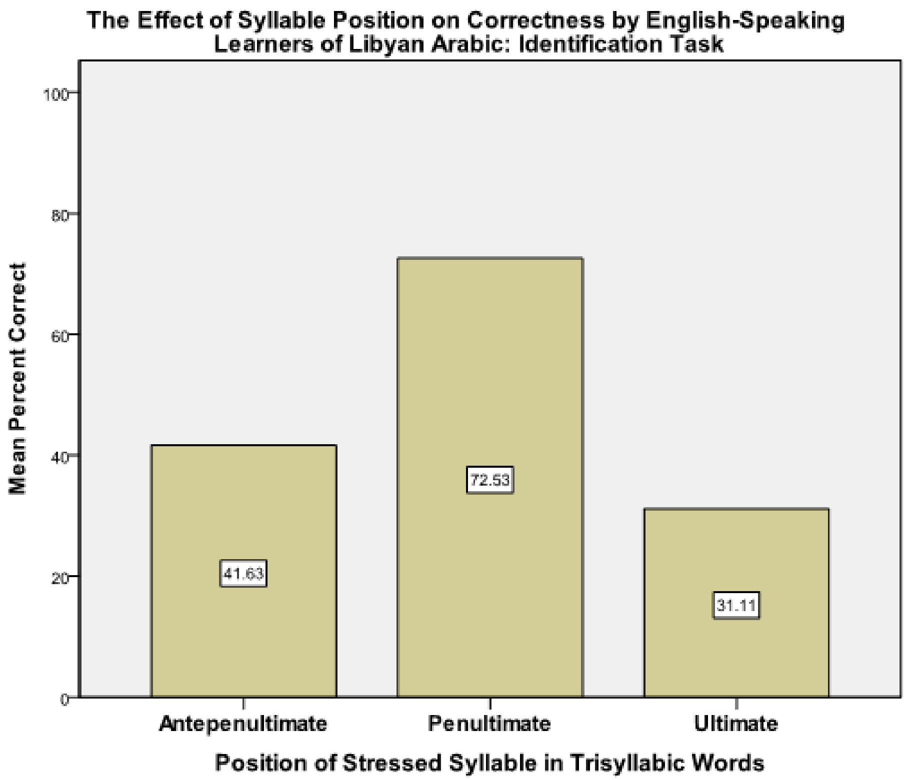
7.4 The Effect of Syllable Structure on Accuracy of Learners in Stress Perception

In this section, I will shed light on the effect of syllable position on correctness and I will also examine if there is a relationship between vowel length and syllable closure on correctness in the phonological patterns and if there is a relationship between vowel quality and syllable position on correctness in the mixed conditioned patterns. Similar to the previous chapter, I will start with the phonological patterns of trisyllabic and disyllabic words, followed by the mixed conditioned patterns.

7.4.1 Syllable Position on Accuracy of Learner Perception in Trisyllabic Words

The learners were more successful in locating stress when the penultimate syllable was the stress holder. There was an overall significant effect of syllable position (Wald Chi Square = 12.59, $p = 0.002$). Descriptively, the learners responded accurately to penultimate stress more than antepenultimate stress. A pairwise post hoc comparison between the pairs was run and it emerged that the difference between the penultimate and the ultimate syllables was statistically recognised in that the performance of the learners was significantly more accurate where the targeted stressed syllable was the penultimate one compared to the ultimate one (Wald Chi Square = 13.16, $p < 0.001$). Figure 7.7 is below.

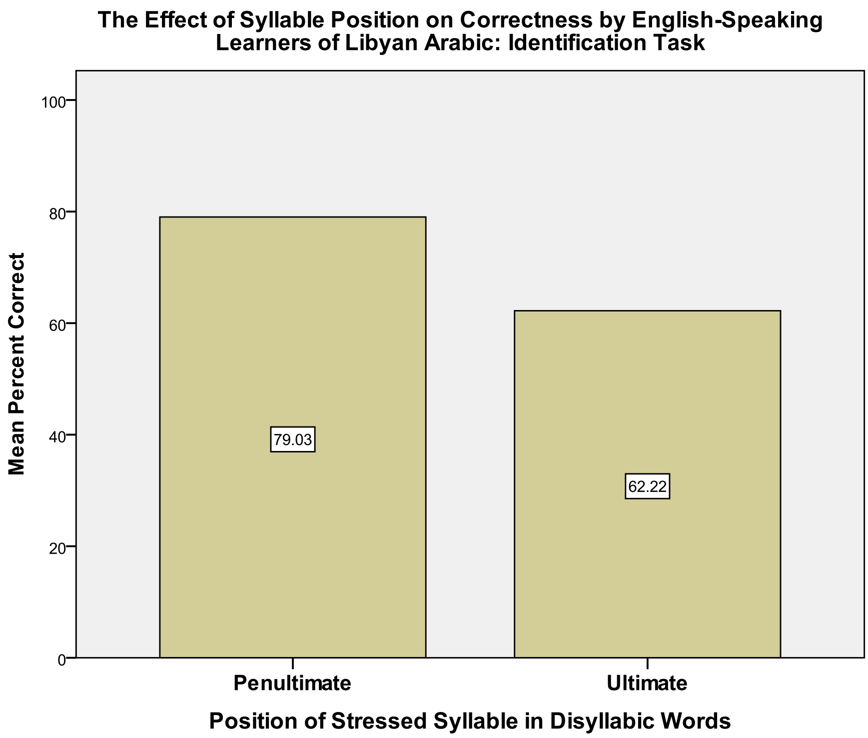
Figure 7.7: The Effect of Syllable Position on Accuracy of Stress Perception in Trisyllabic Words by Learners



7.4.2 Syllable Position on Accuracy of Learner Perception in Disyllabic Words

The learners were more successful at locating the position of stress where words carried it on the penultimate syllable. Despite that, the result of the test was not significant (Wald Chi Square = 0.118, p = 0.731). This means that the effect of the syllable position was not great in disyllabic words, regardless of the difference in correctness between the two positions. (See Figure 7.8 below for demonstration).

Figure 7.8: The Effect of Syllable Position on Accuracy of Stress Perception in Disyllabic Words by Learners



7.4.3 Vowel Length versus Syllable Closure on Accuracy of Learner Perception in Trisyllabic Words

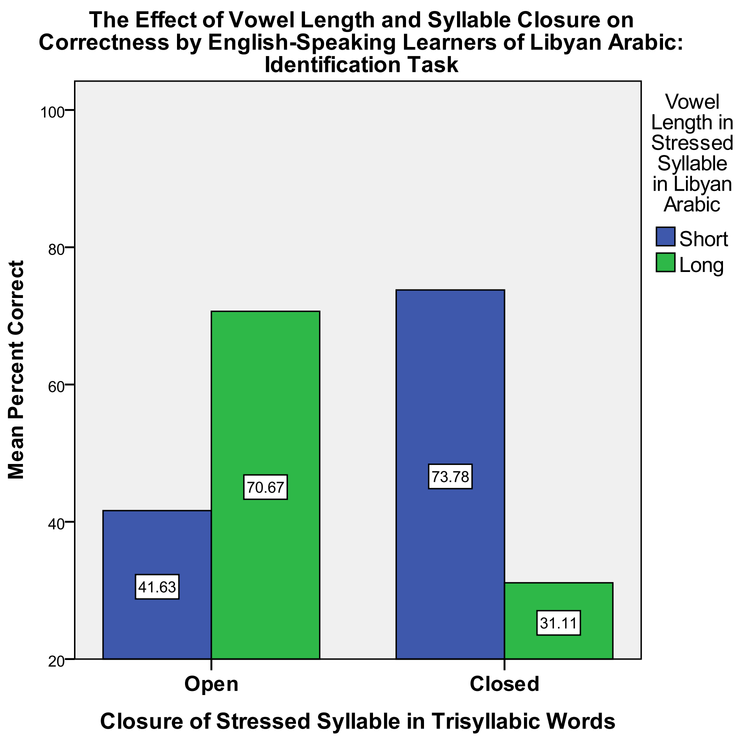
No significant effect was found for either vowel length (Wald Chi Square = 0.520, p = 0.471) or syllable closure (Wald Chi Square = 0.005, p = 0.944) on correctness. However, the interaction between vowel length and syllable closure was significant (Wald Chi

Square = 7.82, p = 0.005). This shows that the combination of the long open vowel and short closed vowel significantly affected correctness. Where these combinations occurred in the targeted stress syllable, the learners performed more successfully than when the opposite combinations of a short open or long closed vowel occurred in the syllable that bore stress-this finding is similar to production (section 4.4.3). Table 7.37 summarises the ranking for accuracy of the syllable structures in the learners' perception.

Table 7.37: Accuracy Ranking of Syllable Structures in Learner Perception of Trisyllabic Words

CVC	CV:	CV	CV:C
73.78%	70.67%	41.63%	31.11%

Figure 7.9: The Effect of Vowel Length versus Syllable Closure on accuracy of Stress Perception in Trisyllabic Words by Learners



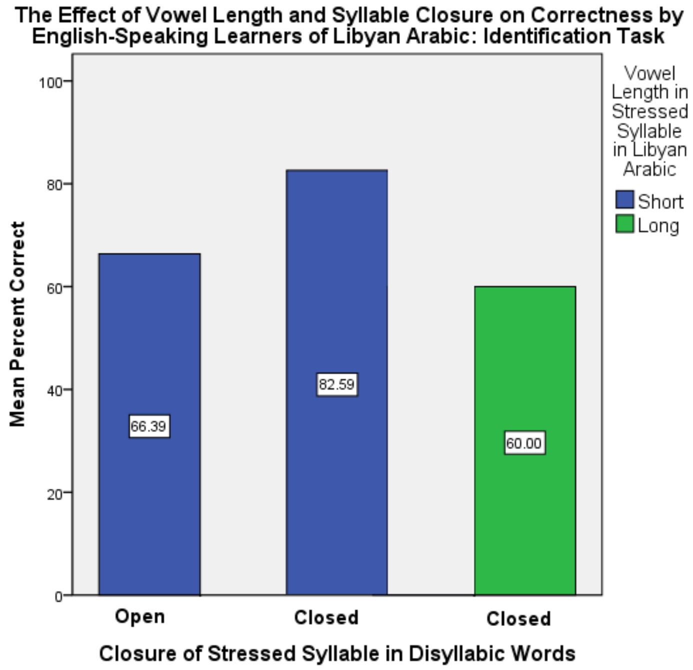
7.4.4 Vowel Length versus Syllable Closure on Accuracy of Learner Perception in Disyllabic Words

Descriptively, short closed vowels in targeted stress syllables was identified more correctly than short open or long open structures in the targeted stress syllables. The interaction between length and closure was not calculated because of the absence of long open structures in disyllabic words. Vowel length affected the accuracy, with a significant difference in accuracy between short closed and long closed targeted syllables (Wald Chi Square = 6.28, p = 0.012) but syllable closure was found nonsignificant (Wald Chi Square = 2.25, p = 0.133) on correctness in short open and short closed structures. The learners were least correct when the superheavy syllable was the target stress holder while they were most accurate when the CVC heavy was the target. (See Table 7.38 below& cf Section 5.4.4).

Table 7.38: **Accuracy Ranking of Syllable Structures in Learner Perception of Disyllabic words**

CVC	CV	CV:C
66.39%	82.59%	60%

Figure 7.10: The Effect of Vowel Length and Syllable Closure on Accuracy of Stress Perception in Disyllabic Words by Learners



7.4.5 Syllable Position and Vowel Height on Accuracy of Learner Perception in Mixed Conditioned Patterns

Similar to the production task, I will attempt to see whether there is an effect of syllable position on correctness in the mixed conditioned patterns and whether or not there is a relationship between vowel quality and syllable position on correctness. I will start by presenting the learners' results and then those of the native speakers.

Interestingly, the learners showed a similar pattern in the tasks with regard to syllable position. They were more accurate in words which received stress in the ultimate position as in Figure 7.11. The targeted stressed syllables with high vowels were perceived more accurately, in 75.56% of cases. It seems that vowel quality had no effect in the penultimate position, because targeted stressed syllables with high and low vowels reached more or less the same level of accuracy, as illustrated in Figure 7.12.

Figure: 7.11: The Effect of Syllable Position on Accuracy of Stress Perception in Mixed Conditioned Patterns by Learners

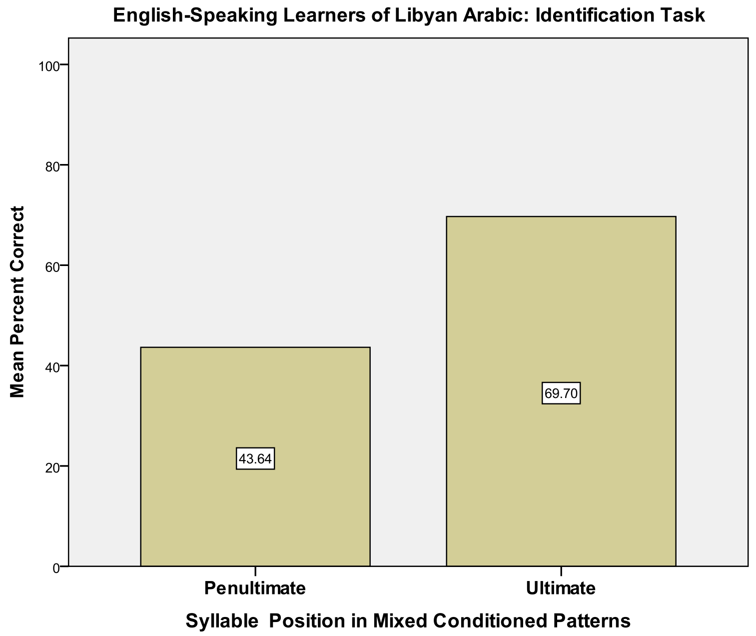
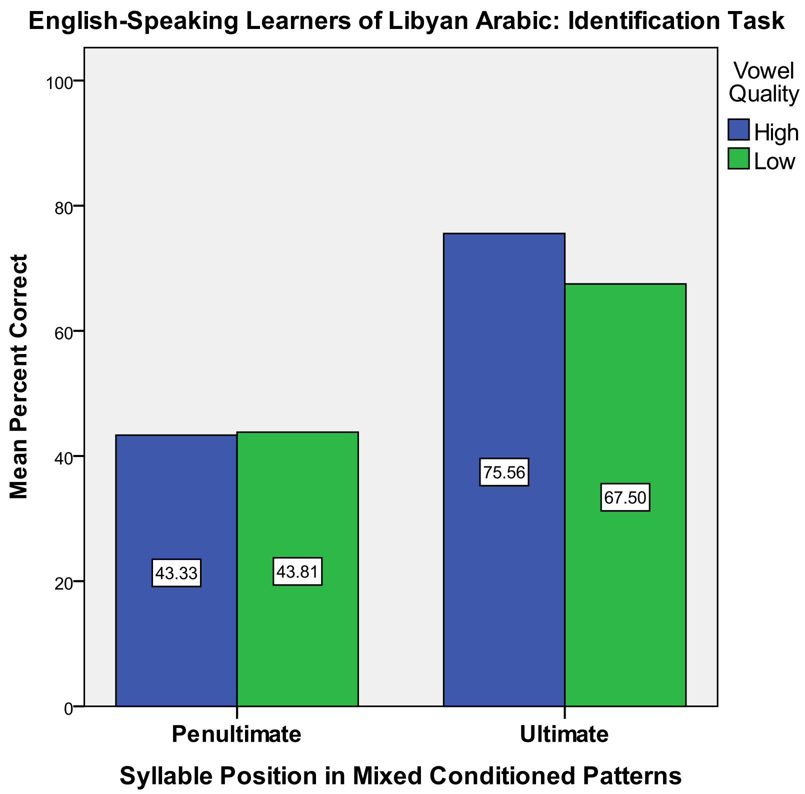


Figure 7.12: The Effect of Syllable Position versus Vowel Quality on Accuracy of Stress Perception in Mixed Conditioned Patterns by Learners



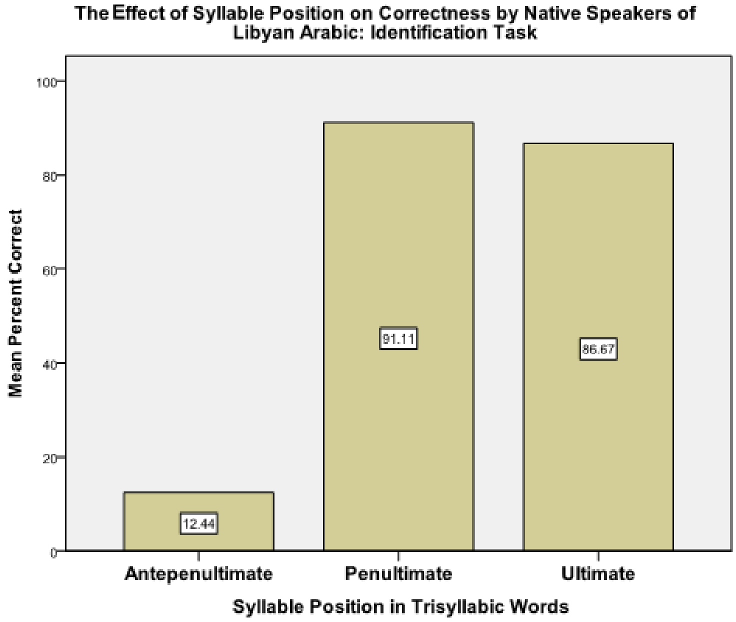
7.5 Effect of Syllable Structure on Accuracy of Native Speakers in Stress Perception

In this section, I will show whether there is an effect of syllable position on accuracy, or whether there is a relationship between vowel length and syllable closure on accuracy in the performance of the native speakers.

7.5.1 Syllable Position on Accuracy of Native Speaker Perception in Trisyllabic Words

Syllable position significantly affected accuracy in trisyllabic words. The overall difference score (Wald Chi Square = 57.10, $p < 0.001$) obtained from the Generalised Linear Model was significant. The natives accurately identified the stress location in words that were produced with penultimate stress more often than words that are produced with antepenultimate stress. There was a significant effect of syllable position between the penultimate and antepenultimate syllables (Wald Chi Square = 38.86, $p < 0.001$). Also, words with ultimate stress were accurately responded to compared with words with antepenultimate stress, giving a significant score (Wald Chi Square = 25.29, $p < 0.001$). There was no significant effect of syllable position between words stressed on the penultimate and ultimate syllables (Wald Chi Square = 0.009, $p = 0.926$). See Figure 7.13 below for demonstration.

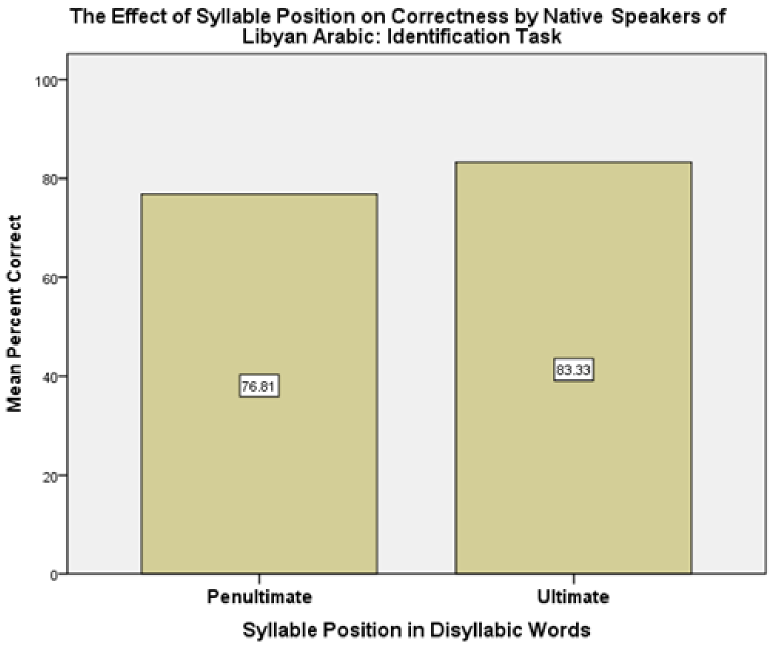
Figure 7.13: The Effect of Syllable Position on Accuracy of Stress Perception in Trisyllabic Words by Native Speakers



7.5.2 Syllable Position on Accuracy of Native Speaker Perception in Disyllabic Words

The natives were more successful in identifying words with ultimate stress. However, syllable position showed no significant effect on stress position in disyllabic words (Wald Chi Square = 0.9, $p = 0.340$) because there was not a vast difference between the words with penultimate stress and words with ultimate stress as shown in Figure 7.14.

Figure 7.14: The Effect of Syllable Position on Accuracy of Stress Perception in Disyllabic Words by Native Speakers



7.5.3 Vowel Length versus Syllable Closure on Accuracy of Native Speaker Perception in Trisyllabic Words

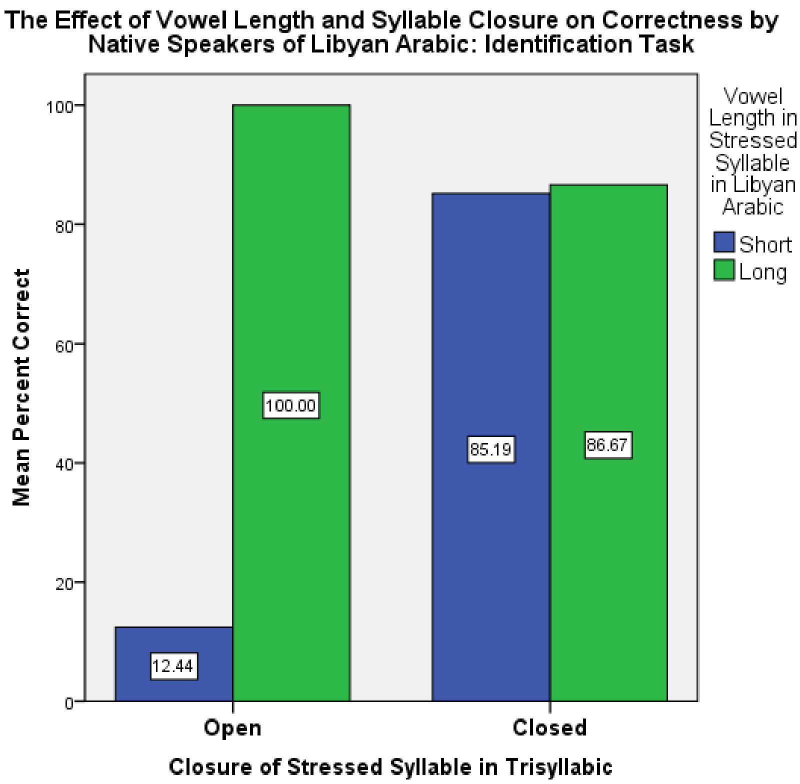
Due to the ceiling effect, it was not possible to conduct any statistical tests; descriptively, however, the natives were most accurate when the combination of a long open syllable occurred as the actual stress landing site. This means that the length is a cue used by the native speakers to identify stress (more discussion in Chapter 8). Moreover, they were least accurate at selecting the stress position when the combination of a short open syllable was the actual stress bearer. The length in closed structure has no effect because there was hardly any difference in the mean percentage, as shown in Figure 7.39 below, and both the long closed and short closed structures achieved an accuracy score of above

85%. However, the length in open structures did affect accuracy. Table 7.39 summarises the accuracy ranking of syllable structures that will be used in Chapter 8.

Table 7.39: Accuracy Ranking of Syllable Structures in Native Speakers Perception of Trisyllabic Words

CV:>	CV:C>	CVC>	CV
100%	86.67%	85.19%	12.44%

Figure 7.15: The Effect of Vowel Length versus Syllable Closure on Accuracy of Stress Perception in Trisyllabic Words by Native Speakers



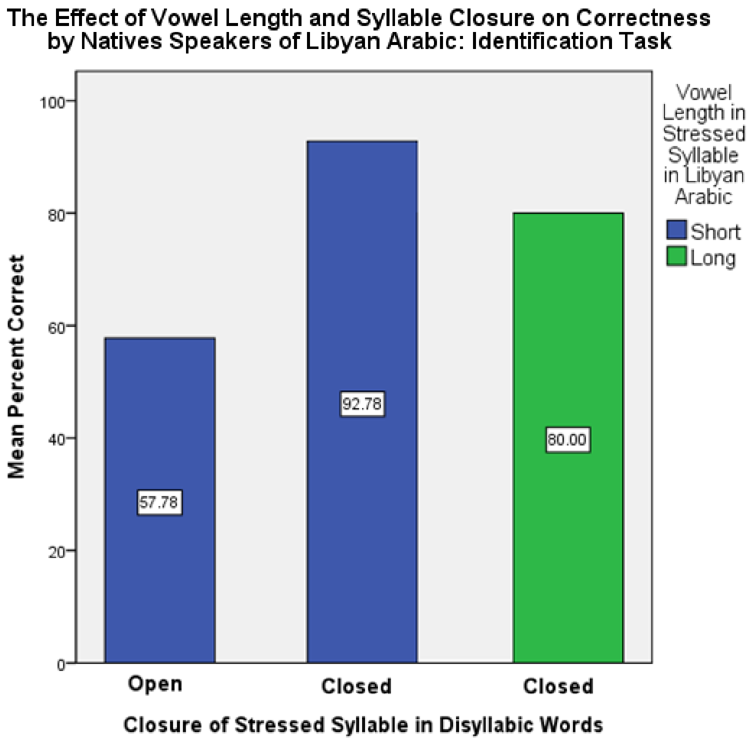
7.5.4 Vowel Length versus Syllable Closure on Accuracy of Native Speakers Perception in Disyllabic Words

Descriptively, the natives were more accurate on targeted close structures, whether long or short, than open structures. However, they responded to close short structures more accurately than close long structures. The natives were least correct when the actual stress landing site was an open short structure. It can be noticed that natives were more successful at identifying heavy structures than light ones, as illustrated below.

Table 7.40: Accuracy Ranking of syllable Structures in Native Speaker Perception of Disyllabic Words

CVC	CV:C	CV
92.78%	80%	57.78%

Figure 7.16: The Effect of Vowel Length and Syllable Closure on Accuracy of Stress Perception in Disyllabic Words by Native Speakers



7.5.5 Syllable Position and Vowel Height on Accuracy of Native Speakers Perception in Mixed Conditioned Patterns

Native speakers had a tough time in identifying stress location. The level of accuracy was higher when the actual stress was on the penultimate syllable (82.42%), or when the peak of the syllable contained a high vowel (91.67% in penultimate stress and 80% in ultimate stress). Unexpectedly, although the natives were highly successful in producing items with ultimate stress when the peak contains a low vowel, they were not able to accurately locate the stress in the same structure, as can be seen in the Figure 7.18 where only 28.33% of instances were correct.

Figure: 7.17: The Effect of Syllable Position on Accuracy of Stress Perception in Mixed Conditioned Patterns by Native Speakers

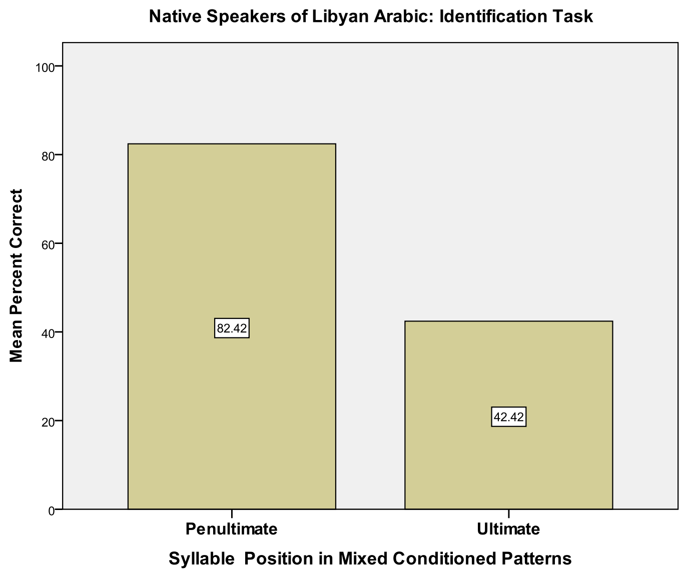
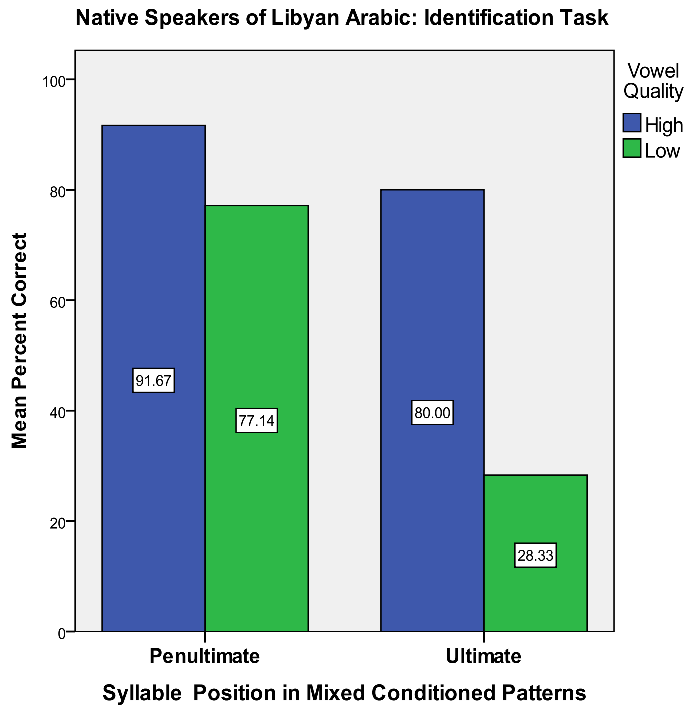


Figure 7.18: The Effect of Syllable Position versus Vowel Quality on Accuracy of Stress Perception in Mixed Conditioned Patterns by Native Speakers



7.6 Conclusion

In the perception task, the learners were most accurate on words containing penultimate stress and least accurate on words containing ultimate stress. The learners and the native speakers agreed in that they perceived words with penultimate stress more correctly, but differed in their preference towards the antepenultimate and the ultimate stress positions. In disyllabic words, the learners disagreed with the native speakers. The learners were least accurate in words with ultimate stress, while the native speakers were most accurate in words with ultimate stress. The opposite occurs in mixed conditioned patterns, as the learners were more accurate in words with ultimate stress in the verbs (similar to production).

The performance of the native speakers provides a support to H2 as they perceived the default structures as stress holder more accurately than the weightless structure- they were responsive to CV: (in patterns 7, 8); CVC (in patterns 4,12, 14, 15) and CV:C (in patterns 9, 10) more than light syllable CV (in patterns 1, 5, 6).

The performance of the learners does not show a strong support to H2 because in few occasions they perceived the light CV as stressed syllable despite its weightless. It seems that the learners relied on the grammatical distinction again in perception which might give a support to H3-3.

In terms of the effect of syllable closure/openness, the learners were more correct on short closed structures than long closed ones. The native speakers showed a different ranking as they were more accurate on long open structures and less accurate on words with short open structures (cf. Tables 7.37 & 7.39). The ranking in the tables will be used in Chapter 8 to develop the constraints.

In the next chapter, I will analyse the results from the current perception task and I will discuss the participants' performance, using an optimality theoretic approach to develop a ranking that governs their perception of stress.

8 Chapter Eight: Discussion of Perception

8.1 Introduction

Learners sometimes find it difficult to locate or perceive stress based on the properties of L1 (Peperkamp and Dupoux 2002; Altmann 2006). The findings of some studies that have examined the perception of stress by learners and native speakers vary in their results. Some studies found that the learners performed better in perception than production (Archibald 1993) and others found that learners performed better in production than perception (Youssef and Mazurkewich 1998; Altmann 2006; Kijak 2009).

Researchers adopt various criteria to explain how learners perceive and locate stress. Cutler and Pasveer (2006) find that English speakers use vowel quality as an indicator for locating stress in their L1 (i.e. reduced and unreduced vowels). It has also been found that syllable structure and lexical class are used by both learners and native speakers to locate and perceive stress (Guion *et.al.* 2003, 2004; Wayland *et. al.* 2006) Moreover, some studies state that not only learners but also native speakers (control group) might find difficulty in locating stress (Kijak 2006; Youssef and Mazurkewich 1998).

In this chapter, I will look at the perception of stress by the learners and the native speakers and explain what factors might be used as stress indicators. Under an optimality theoretic perception model (Boersma 1997; Escudero and Boersma 2004; Salfeeld 2009), constraints that are responsible for indicating stress will be used (see section 1.3.2.2).

Optimality Theory can explain which constraints have power over the perception of stress assignment by the participants. The input is the pronunciation of words by the native speakers that the learners receive and the output is the selection of the syllable which the learners/native speakers perceive to be a stress bearer. The ranking of the constraints will determine what factors affect the perception of stress assignment by the learners and the native speakers. I will identify the constraint ranking of the learners' interlanguage and compare it with the native speakers' ranking of constraints.

The analysis will be displayed based on patterns for trisyllabic and disyllabic words involving phonological patterns and for disyllabic verbs involving mixed conditioned patterns. For the purpose of the discussion, I will combine some patterns together in the discussion and I will not present the patterns in order.

8.2 Phonologically Conditioned Patterns of Trisyllabic Words

8.2.1 CV.cv.cv Pattern (1) and cv.CVː.cv Pattern (7)

In pattern (1), the learners correctly perceive the stress assignment of some instances in this pattern. Surprisingly enough, the native speakers performed worse (Chapter 7). The learners select the antepenultimate syllable as the stressed one while the native speakers perceive all three positions as potential stressed syllables. One might suggest that this is a result of the variation between the grammar of the two languages. Possibly, the stress indicators recognised by the native speakers to perceive stress are absent in pattern (1) consequently the native speakers found it hard to perceive the prominent part of the word but the learners selected the prominent part of the word in pattern (1). Statistically, the learners did not choose one site more than any other (even though there was a numerical trend favouring the antepenultimate site).

However, if we look at pattern (7), the native speakers reached the top limit with accurate perceptual categorisation of the penultimate syllable as the stressed syllable. The learners showed the same numerical trend towards choosing the penultimate syllable as the stress bearer as the native speakers exhibited, this pattern was not statistically significant in the learners, suggesting that the learners were not confident in their choices, in contrast to the native speakers. This performance suggests that the main indicator of the perception of stress by the native speakers is the duration of the syllable (i.e. length of vowel) although other indicators might also be used. It seems then, that length of the vowel is a stronger cue for the native speakers than the learners in perceiving stress location correctly. Duration/vowel length is an active condition in both languages but it seems that it is dominant in LA more than the Learners' IL.

So what strategy do the learners and the native speakers employ to recognise the optimal output in perceiving stress? The listeners interpret the stress cues or indicators by determining where the stress might fall on the word. The mapping between perception and selection of the stressed syllable is lost, especially where the stressed syllable has less duration (no long vowels). However, there are cases where a stressed syllable can be strictly determined by methods other than duration, such as vowel reduction or intensity based stress. So vowels are produced with no reduction and no length but the main indicator of stress is symbolised in the intensity of the stressed syllable. The process of stress perception from the surface form (i.e. the accurate production by the native speaker) to the underlying form (i.e. the choice of the stressed syllable) will include ranking of constraints that derive the optimal output.

Patterns that show intensity-based stress such as pattern (1) require a constraint that insists that every word must receive stress, regardless of any length condition or reduction condition. A suggested constraint is LICENCESTRESS, which demands that every word must have stress, even though the stressed syllable has no long vowel and the surrounding syllables are not reduced. However, to satisfy LICENCESTRESS, a MATCHSTRESS constraint proposed by Broselow (2009) and Davidson and Noyer (1996) will be violated. The latter requires stress to fall on the same syllable in the surface form (production form of the native speakers). So the markedness constraint LICENCESTRESS dominates the faithfulness constraint MATCHSTRESS. These constraints alone are not sufficient to derive the perception of stress by the learners and the native speakers. Therefore, a set of constraints called cue constraints which were first introduced by Boersma (2006); Escudero (2005) and Boersma (2009) will be implemented along with markedness and faithfulness constraints to examine the strategy adopted by the two groups of participants. Boersma (2009, p. 4) states that ‘‘cue constraints express the language user’s knowledge of cues (i.e. the relation between the auditory forms and phonological surface forms’’.

The first suggested cue constraint in stress perception is [DURATION] which requires syllables with a long duration that is represented in long vowels to be selected as the stress bearer. However, another cue constraint is [-DURATION] that disallows syllables with high intensity but no duration (vowel length) to be perceived as a stressed syllable. In the grammar of learners who managed to select the accurate stress position in pattern (1), [-DURATION] constraint is ranked low to give rise to intensity based stress syllables being perceived as the stress bearer.

In Tableau 8.1, candidate (a) is excluded due to violating LICENCESTRESS (non of the syllables is stressed), while candidates (c) and (d) are excluded because they violate MATCHSTRESS. Candidate (b) is the optimal output despite its violation to [-DURATION]; therefore, it should be low ranked to allow intensity based stress syllables to be perceived as stressed one in the absence of other stress cues.

Tableau 8.1: Learners (Pattern 1)

/ˈʃa.ri.ka/	LICENCE STRESS	DURATION	MATCHSTRESS	[-DURATION]
a. ʃa.ri.ka	*!			
✓ b. ˈʃa.ri.ka				*
c. ʃa. ˈri.ka			*!	
d. ʃa.ri. ˈka			*!	

Unexpectedly, native speakers showed uncertain performance in locating the stress position on words. It seems the lack of duration (represented in vowel length) affects their perception of stress even in their mother tongue. Therefore, the number of instances chosen by the native speakers is equal (cf Figure 7.4, Chapter 7) Three positions are perceived as potential stress bearers. This implies that there is no dominance relation between MATCHSTRESS and [-DURATION] which allows candidates (b), (c) and (d) to be a potential output.

Tableau 8.2: Native Speakers (Pattern 1)

/ˈʃa.ri.ka/	LICENCE STRESS	DURATION	MATCHSTRESS	[- DURATION]
a. ʃa.ri.ka	*!			
→b. ˈʃa.ri.ka				*
→c. ʃa. ˈri.ka			*	
→d. ʃa.ri. ˈka			*	

As mentioned earlier, the native speakers reached the top limit of accuracy in perceiving stress in pattern (7) because of the strong effect of the length of the vowel in perceiving stress. This indicates that it is a major indicator of stress in production and perception of stress. So the non- dominance relation between MATCHSTRESS and [-DURATION] does not play a role in the perception of stress in this pattern. However, the [DURATION] constraint excludes candidates (b) and (d) while the optimal output (c) does not violate any constraints as can be seen below.

Tableau 8.3: Native Speakers (Pattern 7)

/ru'za:ta/	LICENCE STRESS	DURATION	MATCHSTRESS	[- DURATION]
(a) ruza:ta	*!			
(b) 'ruza:ta		*!	*	
✓(c) ru'za:ta				
(d) ruza:'ta		*!	*	

Although the learners are less accurate than the native speakers in perceiving stress in pattern (7), they achieve reasonable performance. Similar to the native speakers, candidate (c) is the optimal output due to the satisfaction of *cue*, *markedness* and *faithfulness* constraints. Therefore, the dominance relationship in the grammar of the learners between MATCHSTRESS and [-DURATION] does not change the outcome of choosing the optimal candidate.

Tableau 8.4: Learners (Pattern 7)

/ru'za:ta/	LICENCE STRESS	[DURATION]	MATCHSTRESS	[- DURATION]
(a) ruzata	*!			
(b) 'ruza:ta		*!	*	
✓(c) ru'za:ta				
(d) ruza:'ta		*!	*	

8.2.2 cvc.CVC.cv Pattern (3) and cv.CVC.cvc Pattern (4)

The native speakers were extremely successful at perceiving stress in these patterns and their performance was just below the top limit of accuracy. The learners were also considered successful at perceiving stress but they were less accurate than the native speakers. The question is how did both groups perceive stress in these patterns? What happens between the auditory form and the phonological form? The duration cue that is represented in the length of the vowel is not available in these patterns.

Gordon (2006, p. 233) states that the duration of syllable can involve lengthening a vowel in an open syllable or the closure of a syllable by a consonant. Duration is a major cue in perceiving stress in both languages (Zuraiq, 2005) and it can be modulated by either the length of the vowel in an open syllable as in pattern (7), or the closure of the syllable by a consonant as in the current patterns. Therefore, the [DURATION] constraint is expanded into [LONGOPEN] to refer to length as a stress indicator and to [SHORTCLOSED] to refer to closure as a stress indicator as illustrated below, where they will be referred to as structure cues or/and structure constraints.

The [SHORTCLOSED] constraint requires a syllable that is closed to be perceived as a stress holder, while the [LONGOPEN] constraint requires a syllable with a long vowel to be perceived as a stress holder. In the tableau below, the split of the [DURATION] constraint expands the notion of which syllable might be perceived as a stress bearer; however, this stimulates a violation of every closed syllable that does not receive the main stress. So candidate (a) is eliminated as it violates the main constraint LICENCESTRESS. Candidate (d) violates the [LONGOPEN] constraint so it is excluded but it does not violate constraint [-DURATION] as it is produced with less intensity than needed for a potential syllable to be stressed. Both candidates (b) and (c) violate [SHORTCLOSED] constraint but candidate (c) wins because it does not violate MATCHSTRESS constraint.

Tableau 8.5: Learners (Pattern 3 and Pattern 4)

A /mus.'taʃ.fa/ Pattern (3)	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	MATCHSTRESS	[- DURATION]
a. mustaʃfa	*!		**		
b.'mus.taʃ.fa			*	*!	
✓c. mus'taʃ.fa			*		
d. mus.taʃ.'fa		*!	**	*	
B /mu'handis/ Pattern (4)	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	MATCHSTRESS	[- DURATION]
a. mu.han.dis	*!		**		
b. 'mu.han.dis		*!	**	*	
✓c. mu.'han.dis			*		
d. mu.han.'dis			*	*!	

In fact, the native speakers performed better than learners did and a significant difference is found in the results. Moreover, it can be noticed that [-DURATION] is not violated and consequently the dominance relation between MATCHSTRESS and [- DURATION] does not affect the outcome of the optimal output. So candidate (c) is the optimal candidate in the perception of the learners as well as the native speakers.

Tableau 8.6: Native Speakers: (Pattern 3 and Pattern 4)

A. /mus.'taʃ.fa/ pattern (3)	LicenceStress	[LongOpen]	[ShortClosed]	MatchStress	[- Duration]
a. mustaʃfa	*!		**		
b.'mus.taʃ.fa			*	*!	
✓c. mus'taʃ.fa			*		
d.Mus.taʃ.'fa		*!	**	*	
B. /mu'handis/ Pattern (4)	LicenceStress	[LongOpen]	[ShortClosed]	MatchStress	[- Duration]
a. mu.han.dis	*!		**		
b. 'mu.han.dis		*!	**	*	
✓c. mu.'han.dis			*		
d. mu.han.'dis			*	*!	

8.2.3 cvc.CVC.cvc Pattern (2)

In this pattern, the native speakers correctly perceived the location of stress in the majority of instances. However, comparing the performance of both groups, the learners performed slightly worse than the native speakers as shown in Chapter 7. However, the learners perceived a higher number of accurate instances than inaccurate ones. The constraints that are responsible for the correct identification of stress position by both native speakers and learners are shown in the tableaux below.

Tableau 8.7: Learners (Pattern 2)

/mis.'taw.sif /	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	MATCHSTRESS	[- DURATION]
a.mistawsif	*!		***		
b.'mistawsif			**	*!	
✓c.mis'tawsif			**		
d.mistaw'sif			**	*!	

Tableau 8.8: Native speakers (Pattern 2)

/mis.'taw.sif/	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	MATCHSTRESS	[- DURATION]
a.mistawsif	*!		***		
b.'mistawsif			**	*!	
✓ c.mis'tawsif			**		
d.mistaw'sif			**	*!	

This might work well for native speakers and learners who perceived it accurately; however, there is a significant minority of instances which were perceived by the learners with antepenultimate stress. This is possibly an indication as to what position is most likely perceived as the stress bearer apart from the penultimate syllable.

It seems that another indicator or cue to determine the location of stress is needed here. Perhaps the mapping between the auditory form and the phonological form involves learning that stress has a function of both duration and position (i.e. structure and position). Indeed, a similar finding has been found by Broselow (2009); the most frequent prominent part of words is normally the penultimate syllable, which is perceived as the stressed syllable. Therefore, another suggested cue constraint could be [NON-PERIPHERAL POSITION] that prioritises the default position to be the perceived stressed syllable (i.e. the penultimate syllable). Whereas the [PERIPHERAL POSITION] constraint allows syllables such as the antepenultimate and ultimate ones to be perceived as the stress bearer.

In Tableau 8.9, [PERIPHERAL POSITION] dominates [NON-PERIPHERAL POSITION]; therefore in order to satisfy the former constraint, the latter will be violated. Candidates (b) and (d) are optimal outputs. When perception was inaccurate, learners perceived candidate (b) with the antepenultimate syllable as the stress bearer while the native speakers chose the ultimate syllable on a few occasions.

Tableau 8.9: Inaccurate Perception by Learners and Native Speakers (Pattern 2)

/mis.'taw.sif /	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[NON-PERIPHERAL POSITION]
a.mistawsif	*!		***				
→b.'mistawsif			**		*		*
c. mis'tawsif			**	*!			
→d.mistaw'sif			**		*		*

However, as a result of two optimal candidates (b) and (d) above, the [PERIPHERAL POSITION] constraint should be parameterised into two constraints based on the direction of the stressed syllable. [PERIPHERAL POSITION- RIGHT] promotes the perception of the ultimate syllable as a potential stress bearer and [PERIPHERAL POSITION- LEFT] promotes the perception of the antepenultimate syllable. [PERIPHERAL POSITION- RIGHT] outranks [PERIPHERAL POSITION- LEFT] in the native speakers' grammar, but the opposite happens in the learners' grammar. Recalling the results from Chapter 7, it has been found in this study that the antepenultimate syllable is the second position that is perceived as a stress holder by the learners, while the ultimate syllable is the second position that is perceived by the native speakers (See Figure 7.7 for the learners and 7.13 for the native speakers).

In Tableau 8.10, [PERIPHERAL POSITION- RIGHT] outranks the [NON-PERIPHERAL POSITION] constraint in the natives' perception and gives candidate (d) as the optimal output. In Tableau 8.11, [PERIPHERAL POSITION- LEFT] outranks the [NON-PERIPHERAL POSITION] constraint in the learners' perception and gives candidate (b) as the optimal output. The violation of the [PERIPHERAL POSITION] constraint and also the dominance relationship between this constraint and MATCHSTRESS exclude candidates (b) and (c).

Tableau 8.10: Inaccurate Perception by Native Speakers (Pattern 2)

/mis.'taw.sif/	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[PERIPHERALPOSITION- RIGHT]	MATCHSTRESS	[-DURATION]	[NON-PERIPHERAL POSITION]
a. mistawsif	*!		***				
b.'mistawsif			**	*!	*		*
c. mis'tawsif			**	*!			
✓d .mistaw'sif			**		*		*

Tableau 8.11: Inaccurate Perception by Learners (Pattern 2)

/mis.'taw.sif /	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[PERIPHERAL POSITION- LEFT]	MATCHSTRESS	[-DURATION]	[NON-PERIPHERAL POSITION]
a.mistawsif	*!		***				
√b.'mistawsif			**		*		*
c. mis'tawsif			**	*!			
d.mistaw'sif			**	*!	*		*

However, to account for the accurate perception of the stress position, the [NON-PERIPHERAL POSITION] constraint outranks [PERIPHERAL POSITION]. This provides candidate (c) as the optimal candidate as in 8.12.

Tableau 8.12: Native Speakers (Pattern 2)

/mis.'taw.sif/	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a.mistawsif	*!		***				
b.'mistawsif			**	*	*!		
√c. mis'tawsif			**				*
d.mistaw'sif			**	*	*!		

The peripheral element can be problematic (1) it is not valid with disyllabic words, (2) what is considered to be a ranking that should give an accurate outcome coinciding with the grammar of the language [NON-PERIPHERAL POSITION] >> [PERIPHERAL POSITION] provides a false output in pattern (1) */ʃa'rika/ as illustrated in Tableau 8.13 A. However, what is considered to be a ranking that would give an inaccurate outcome [PERIPHERAL POSITION]>> [NON-PERIPHERAL POSITION] renders the actual output /'ʃarika/ in pattern (1) as can be seen in Tableau 8.13 B.

Tableau 8.13 A: Inaccurate Optimal Candidate (Pattern 1)

A /'ʃarika/	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a.ʃarika	*!						
b.'ʃarika				*!			
→c.*ʃa'rika					*		*
d.ʃari'ka				*!	*		

Tableau 8.13 B: Accurate Optimal Candidate (Pattern 1)

B /ˈʃarika/	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[NON-PERIPHERAL POSITION]
a.ʃarika	*!						
→b. ˈʃarika						*	
c. ʃa'rika				*!	*		*
d.ʃari'ka					*!		

One might suggest that intensity is strongly involved here in perceiving stress location. Stress has a function of intensity–the loudness involved in producing syllables. Perhaps learners perceive this cue more than the native speakers do; therefore the native speakers had a harder time in perceiving stress location that lacks duration. So the [+INTENSITY] constraint promotes stress on the loudest syllable. Boersma (2011) suggests that in order to account for the perception of stress, cue constraints such as duration, pitch or intensity can be used in interaction with structural constraints (markedness and faithfulness). If the structural [NON-PERIPHERAL POSITION] constraint disfavours the antepenultimate syllable for example, the [+INTENSITY] constraint would promote the perception of stress on syllables that lack duration but have prominence despite the peripheral position condition. In Tableau 8.14, candidates (c) and (d) are out because the syllables that are perceived as stress holders do not carry loudness (intensity) in accordance with the auditory form. Although the optimal candidate (b) violates [NON-PERIPHERAL POSITION], it is the winner because [+INTENSITY] outranks [NON-PERIPHERAL POSITION]. The former constraint allows syllables to be perceived as prominent despite the absence of other structural and durational stress indicators.

Tableau 8.14: Actual Optimal (Revisiting Pattern 1)

/ʃarika/	LICENCESTRESS	[+INTENSITY]	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[- DURATION]	[PERIPHERAL POSITION]
a.ʃarika	*!							
→b.'ʃ**a**rika					*		*	
c.ʃa'rika		*!				*		*
d.ʃari'ka		*!			*			

The performance of the native speakers is intriguing and does not reach any consensus on what syllable to choose. That is due to the low-ranking of the **[+INTENSITY]** constraint which leads to the elimination of the actual output and to the **[PERIPHERAL]** constraint that affects the perception of the stressed syllables and controls whether the default position or the right-most syllable would be perceived as the stress holder.

8.2.4 CV.cvc.cv Pattern (5) and CV.cvc.cvc Pattern (6)

These two patterns confirm the above scenario in which the learners are more sensitive to the requirement of **[+INTENSITY]** compared to the native speakers. However, the native speakers were not successful in locating the position of stress, as the vast majority of instances were perceived with penultimate stress while the learners were marginally more successful. According to Kijak (2009), it has been found that English speaking participants perform better in perceiving the stress location of nonsense words than

French and Chinese speaking participants. However, English-speaking participants perform worse than Russian and German speaking participants in the same study. In Altmann's work (2006), Arabic, French and Turkish speaking participants performed worse than English-speaking participants did. This means that English-speaking participants perform better than Arabic speakers, but not as well as participants from other linguistic backgrounds such as Russian or German speakers. Kijak (2009, p. 321) said that ''the native speakers of some L1s may not be able to hear stress in their L1 but they are still perfectly capable of producing 100% correct stress patterns of their L1.'' In fact, this is confirmed in this study where the native speakers of Libyan Arabic failed to locate stress in these two patterns despite the fact that they produced the items with an accuracy rate of 100% in the production task. The English-speaking learners' perception is relatively better than the native speakers of Libyan Arabic. This might be a result of being able to hear stress based intensity, while native speakers are ''stress deaf'' (Peperkamp and Dupoux, 2002) in their own language if stress is mainly judged by indicators other than vowel length or syllable closure. It seems that that successful production will not always lead to successful perception of stress in either one's mother tongue or in a second language.

Therefore, [+INTENSITY] constraints would play a major role in the perception of stress in these two patterns. Moreover, this constraint occupies two levels of dominance. Firstly, it is highly ranked and not dominated; this can be seen when learners successfully perceive intensity based stress in patterns (1), (5) and (6). Secondly, it is dominated by [SHORTCLOSED] and [LONGOPEN] in the grammar of the learners and native speakers that perceive the penultimate syllable as a stress carrier, perhaps they are sensitive to the requirement of [SHORTCLOSED] more than the requirement of

[+INTENSITY]. So level (1) is: [+INTENSITY] >> [SHORTCLOSED] >> [LONGOPEN] and level (2) is: [SHORTCLOSED] >> [LONGOPEN] >> [+INTENSITY].

In Tableau 8.15 A, [+INTENSITY] is not dominated and outranks other constraints. In fact, this ranking derives accurate perception of stress location but only a significant minority of instances chosen by the learners give candidate (b) as the optimal output. In order to satisfy [+INTENSITY], [SHORTCLOSED] is violated because the penultimate syllable is not chosen as the stress holder; [NON-PERIPHERAL POSITION] is violated because the edge-syllable is stressed and [-DURATION] is violated because the stress holder has high intensity but lacks duration. Candidates (c) and (d) are fatally excluded because they violate the requirement of [+INTENSITY] that is the syllable with the highest intensity should be perceived as stress carrier.

Tableau 8.15 A: Learners (Pattern 5)

A. /'madirsa/ Pattern 5	LICENCESTRESS	[+INTENSITY]	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. madirsa	*!	*		*		*		
✓b.'**ma**dirsa				*	*		*	
c. ma'**dir**sa		*!				*		*
d. madir'**sa**		*!		*	*	*		

Tableau 8.15 B: Learners (Pattern 6)

B. /'kabiʃkum/ Pattern 6	LICENCESTRESS	[+INTENSITY]	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a.kabiʃkum	*!							
→b.'kabiʃkum				*	*		*	
c. ka'biʃkum		*!				*		*
d. kabiʃ'kum		*!			*	*		

In Tableaux 8.16 A and 8.16 B below, [+INTENSITY] occupies a lower level where it is dominated by [SHORTCLOSED]. In patterns (5) and (6), in order to satisfy the [SHORTCLOSED] constraint, [+INTENSITY] and MATCHSTRESS are violated so the antepenultimate syllable is not perceived as the stress holder, giving candidate (c) as the optimal output. However, candidates (b) and (d) are eliminated as they violate [SHORTCLOSED] while candidate (a) is excluded as it violates the LICENCESTRESS constraint. Pattern 5 and Pattern 6 are analysed below.

Tableau 8.16 A: Inaccurate Perception by Native Speakers/Learners (Pattern 5)

A. /'madirsa/ Pattern 5	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[+INTENSITY]	[-DURATION]	[PERIPHERAL POSITION]
a. madirsa	*!		*		*	*		
b.'madirsa			*!	*			*	
✓c. ma'dirsa					*	*		*
d. madir'sa			*!	*	*	*		

Tableau 8.16 B; Inaccurate Perception by Native Speakers/Learners (Pattern 6)

A. /'kabiʃkum/ Pattern 6	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[+INTENSITY]	[-DURATION]	[PERIPHERAL POSITION]
a.kabiʃkum	*!							
b.'kabiʃkum			*!	*			*	
✓c. ka'biʃkum					*	*		*
d. 'kabiʃ'kum				*!	*	*		

The PERIPHERAL constraints are still problematic because it has been suggested earlier that in pattern (2), the ranking [NON-PERIPHERAL POSITION] >> [PERIPHERAL POSITION] leads to accurate perception while the ranking of [PERIPHERAL POSITION] >> [NON-PERIPHERAL POSITION] does not. This does not work well in patterns (5), (6); it shows the opposite pattern. Despite the demotion of the [+INTENSITY] constraint, the actual output chosen by the participants is recognised as optimal when [NON-PERIPHERAL POSITION] outranks [PERIPHERAL POSITION]. This is because some participants incorrectly choose or perceive the penultimate syllable, which is non-peripheral, as a stress holder in patterns (5) and (6), so [NON-PERIPHERAL POSITION] would dominate [PERIPHERAL POSITION]. However, in pattern (2) the learners and the native speakers inaccurately perceive the edge syllables as stress holders. This means that [PERIPHERAL POSITION] dominates [NON-PERIPHERAL POSITION]. So how some learners and native speakers incorrectly perceive the peripheral syllables as the stress holder in pattern (2), if the requirement of [NON-PERIPHERAL POSITION] must dominate the requirement of [PERIPHERAL POSITION] to ensure consistency in the participants' grammar. I suppose that there is a motivation behind the deviation in this pattern. In Chapter 5, it was explained that some learners simplify pattern (2) in the production task by inserting a vowel or deleting a consonant. Thus, one can suggest it is perhaps more complex than other patterns. We also found that this pattern is not frequent in English (cf Chapter 5). Some learners and native speakers did not perceive the penultimate syllable as the stress bearer in this CVC.CVC.CVC structure,and they disagreed as to the direction in which the stress can be shifted. From the data available and based on this performance, one might propose that there is a constraint against perceiving the penultimate syllable as a stressed syllable in a string of CVC.CVC.CVC by some participants. I propose an ad hoc constraint *CVC.'CVC.CVC that prohibits the perception of a penultimate syllable as a stress bearer in this particular pattern, and in doing so this will provide a consistent ranking for [NON-PERIPHERAL POSITION] >> [PERIPHERAL POSITION] in the grammar of the participants.

8.2.5 cvc.CVː.cv Pattern (8)

The native speakers reach the top limit of accuracy in perceiving the stress location in pattern (8). They also performed successfully in perceiving stress location in pattern (9). However, the learners performed successfully in locating stress in pattern (8) but found it difficult to perceive stress in pattern (9). Let us consider pattern (8). One of the main stress indicators in this pattern is vowel length, which might be used as a trigger to perceive the location of the stress. Actually, the dominance relationship between [LONGOPEN] and [SHORTCLOSED] gives the rise to the actual output candidate (c) being the winner in tableau 8.17. Therefore, candidates (b) and (d) are ruled out due to the violation of the higher ranked [LONGOPEN] in order to satisfy the condition of [SHORTCLOSED]. Candidate (a) is out as it violates the requirement which stipulates that every word has at least one stressed syllable.

Tableau 8.17: Native Speakers (Pattern 8)

/dar.'buː.ka/	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION LEFT]
a. dar.buː.ka	*!						
b.'dar.buː.ka		*!		*	*		
✓c.dar.'buː.ka			*				*
d. dar.buː.'ka		*!	*	*	*		*

However, some learners incorrectly perceive the antepenultimate syllable as the stress location in this pattern. This is because the dominance relation between [LONGOPEN] and [SHORTCLOSED] is different in the grammar of the learners. The [LONGOPEN] constraint is demoted and is outranked by [SHORTCLOSED]. Therefore, the violation of [SHORTCLOSED] eliminates candidates (c) and (d) and promotes candidate (b) as the optimal candidate as can be seen in Tableau 8.18.

Tableau 8.18: Learners (Pattern 8)

/dar.buː.ka/	LICENCESTRESS	[SHORTCLOSED]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION LEFT]
a. dar.buː.ka	*!						
✓b.'dar.buː.ka			*	*	*		
c. dar.'buː.ka		*!					*
d. dar.buː.'ka		*!	*	*	*		*

8.2.6 Revisiting pattern (7)

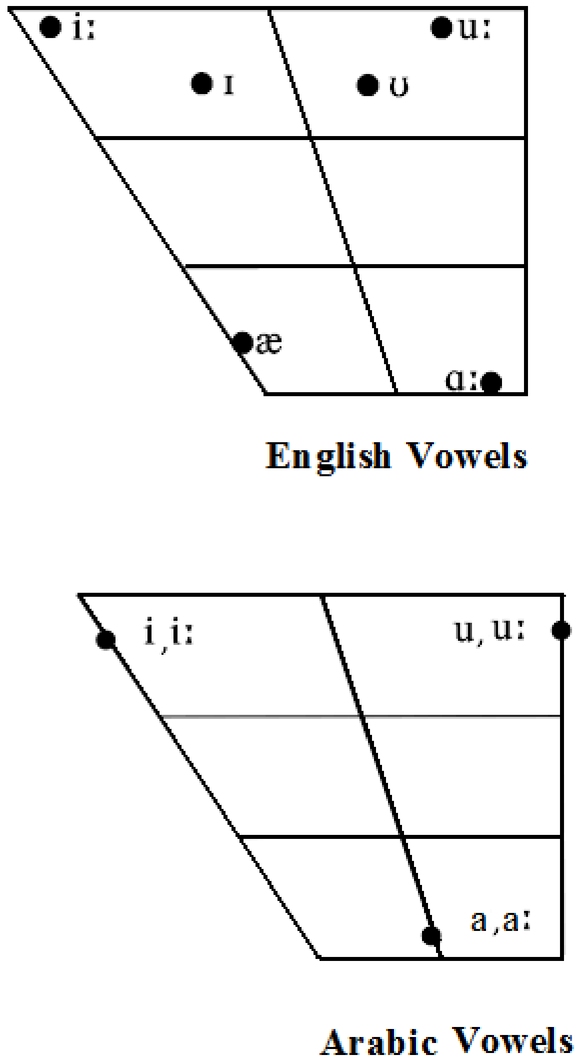
Before we go further and look at pattern (9), a revisit to pattern (7) is required to see how this ranking would match the performance of the participants. The native speakers performed very successfully in perceiving stress in pattern (7). I suppose the above ranking would provide the correct optimal candidate. Hence, candidate (c) is the optimal output whereas the violation of [LONGOPEN] results in the exclusion of candidates (b) and (d), whilst the violation of LICENCESTRESS rules out candidate (a).

Tableau 8.19: Native Speakers (Revisiting Pattern 7)

/ru'za:ta/	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION LEFT]
a. ruzaːta	*!						
b. 'ruzaːta		*!		*	*	*	
✓. ru'zaːta							*
d. ruzaː'ta		*!		*	*	*	*

The above scenario does not fit when the learners inaccurately perceived the antepenultimate syllable as the stressed syllable because the dominance relationship between [LONGOPEN] and [CLOSE SHORT] is irrelevant in this pattern, as the syllables that are involved are open – this results in no violation of [CLOSE SHORT]. If one supposes that the closeness and periphery conditions do not play a major role here, does this mean that the reason for this is that the learners simply do not perceive the length contrast? It is well known that the vocalic system of English is more complex than the vocalic system of Arabic. So what is the cause of the misperception? The Arabic vocalic system is characterised mainly by the height and length distinction and features such as laxness or tenseness are redundant (Kopczynski and Meliani 1993), while English vowels are mainly distinguished in terms of their quality of laxness and tenseness rather than quantity. Arabic native speakers would distinguish vowel pairs in terms of their length. Looking at the charts below, it can be noticed that English vowels differ in both their quality and quantity as opposed to Libyan Arabic pair vowels, where they mainly differ in their quantity.

Figure 8.3: English and Arabic Vowel Charts[37]



So the quality of pairs /i/ and /i:/; /u/ and /u:/; /a/ and /a:/ are more or less identical and they only differ in their duration, which means that the long vowel is a repetition of the short vowels or; in other words; the long one is twice as long as the short vowel (Kopczynski and Meliani 1993, p.188; Al-Ani 1970, p.23). English-speaking learners of

[37] English and Arabic vowels are not limited to the vowels shown in the vowel chart, but there are other vowels. For a full vowels list, see Hammond (1999) for English and Watson (2002) for Arabic.

Arabic might lack this distinction of having a pair of vowels that share the same quality but differ in their quantity. Lehnert-LeHouillier (2007, p. 161) suggests that a cue such as vowel quality is a feature that is intrinsically connected with the vowel and it is an essential cue to identify vowels, which is more valuable than the length feature. This might apply in English; but in Arabic vowels, quantity is responsible for the listeners' perceptual recognition of the vowel type. Possibly, the learners perceive the vowels in terms of their quality more than quantity. If this is true, then the distinction between /i/ and /iː/; /u/ and /uː/, /a/ and /aː/ is not straightforwardly perceived. Perhaps the lack of vowel reduction in the surrounding syllables makes the learners perceive the neighbouring vowels as tense full vowels. Moreover, Canepari (2005, p.319) states that vowels in Arabic might be recognised as semi-long in unstressed syllables. This indicates that vowels are generally tense, but are distinguished in terms of their duration.

If the above claim is correct, then the learners are possibly distracted by the full production of surrounding vowels and also troubled by the fact that they need to rely on length but not laxness or tenseness of vowels as a stress cue to be able to perceive the stressed one as different from the unstressed one. This means that the learners need to rely on a cue that is considered secondary in their L1, but primary in their L2. One might suggest that the learners and the native speakers weigh the length cue differently. The native speakers rely on quantity and the learners rely on quality. Phonetically, vowel length is a repetition in and of itself, which possibly would lead to the misperception of length. This would cause a violation of a proposed constraint, *PUREQUANTITY, because vowel pairs are recognised through their quality in the learners' L1 more than by their durational differences. The *PUREQUANTITY constraint will incur a violation if the peak of the stressed syllable is recognised through its quantity. In Tableau 8.20 A, [LONG OPEN] dominates *PUREQUANTITY so candidates (b) and (d) are out due to the violation of [LONG OPEN] but in Tableau 8.20 B, [LONG OPEN] is demoted and outranked by *PUREQUANTITY. So in order to satisfy *PUREQUANTITY which cannot recognise the vowel through its quantity alone, [LONG OPEN] will be violated. Candidate (c) is ruled out as it violates *PUREQUANTITY and candidate (d) is excluded as it violates [PERIPHERAL POSITION LEFT] giving candidate (b) as the optimal one.

Tableau 8.20: (Revisiting Pattern 7)

A. /ru'za:ta / Native Speakers	LICENCESTRESS	[LONGOPEN]	[SHORTCLOSED]	*PUREQUANTITY	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION LEFT]
a. ruza:ta	*!							
b. 'ruza:ta		*!			*	*	*	
✓c. ru'za:ta				*				*
d. ruza:'ta		*!			*	*	*	*

B. /ru'za:ta/ Learners	LICENCESTRESS	*PUREQUANTITY	[SHORTCLOSED]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION LEFT]
a. ruza:ta	*!							
✓b. 'ruza:ta				*	*	*	*	
c. ru'za:ta		*!						*
d. ruza:'ta				*	*	*	*	*!

8.2.7 cvc.cv.CVːC Pattern (9)

Cue constraints are deployed to understand perception of stress by native speakers and learners. In the previous tableaux, it has been found that the [LONGOPEN] constraint is not dominated in the native speakers' grammar. However, another major cue is found to be highly ranked and unviolated. That is [LONGCLOSED], which conveys the importance of the superheavy syllables and how they consistently bear stress. Therefore, [LONGCLOSED] dominates [LONG OPEN], [SHORTCLOSED], [SHORTOPEN] and *PUREQUANTITY respectively.

Tableau 8.21 below shows that the superheavy syllable is correctly perceived as the stress bearer in a significant majority of instances chosen by native speakers in accordance with the results in Chapter 7. That is because the constraint [LONGCLOSED] is a dominant cue which is accurately perceived and its violation leads to the exclusion of candidates such as (a), (b) and (c) and results in candidate (d) being the optimal output.

Tableau 8.21: Native speakers (Pattern 9)

/buk.ki'ʃaːʃ/	LICENCESTRESS	[LONGCLOSED]	[LONGOPEN]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERALPOSITION LEFT]
a. /buk.kiʃaːʃ/	*!									
b. '/buk.ki ʃaːʃ/		*!			*		*	*		
c. buk'kiʃaːʃ		*!		*	*			*		*
✓d.buk.ki'ʃaːʃ				*	*	*	*			*

The learners were unsuccessful at perceiving the location of stress in this pattern. The incorrect perception of stress is divided between choosing the antepenultimate and penultimate syllables. Let us look at the ranking adopted by the learners in perceiving stress and decide what constraints are demoted to cause this misperception.

If the learners do not perceive the superheavy syllable as a cue for stress, then this [LONGCLOSED] constraint will be demoted along with [LONG OPEN] (as has been found in pattern 8), which will in turn promote the [SHORTCLOSED] constraint and allows candidate (b) to be the optimal output. Therefore, candidates (c) and (d) are eliminated due to the violation of the promoted [SHORTCLOSED].

Tableau 8.22: Learners (Pattern 9)

/buk.kiˈʃa:ʃ/	LICENCESTRESS	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[LONGCLOSED]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERALPOSITIONLEFT]
a. /buk.kiʃa:ʃ/	*!									
b. ✓ˈ/buk.ki ʃa:ʃ/			*		*		*	*		
c. buk'kiʃa:ʃ		*!			*			*		*
d.buk.kiˈʃa:ʃ		*!	*	*			*			*

The learners' choices of the stressed syllable are not consistent, as the penultimate syllable is also perceived as a possible stress holder. To be able to analyse this unforeseen choice of selecting the light penultimate syllable as a stress carrier, another level of ranking will be deployed. That is [ShortClosed] is demoted to convey the unexpected choice of the light antepenultimate syllable. The violation of [ShortOpen] by candidates (b) and (d) rule them out and leaves candidate (c) as the optimal one. However, it is worth mentioning that the result of the perception task in this pattern by the learners was highly insignificant which means that it can be considered to be random variation. The **[LongClosed]** constraint is the main indication for stress in this pattern and it is low ranked; therefore, the learners could not locate the accurate position of stress but due to the insignificance of the results; there is no evidence that [ShortOpen] is ranked higher to result in /buk'ki.ʃa:ʃ/ being optimal as seen in the tableau below. Figure (8.4) shows the constraint demotion of Structural cues.

Tableau 8.23: Learners (Pattern 9)*

/buk.ki'ʃa:ʃ/	LicenceStress	[ShortOpen]	*PureQuantity	[ShortClosed]	[LongClosed]	[LongOpen]	[POSITION] [Non-Peripheral]	MatchStress	[-Duration]	[PeripheralPosition] LEFT]
a./buk.kiʃa:ʃ/	*!									
b.'/buk.ki ʃa:ʃ/		*!			*		*	*		
c.✓buk'kiʃa:ʃ				*	*			*		*
d.buk.ki'ʃa:ʃ		*!	*	*			*			*

Figure 8.4: Constraint Demotion

- Native Speaker Ranking: **[LONGCLOSED]** >> **[LONGOPEN]** >> [SHORTCLOSED] >> [SHORTOPEN] >> *PUREQUANTITY

- Learner Ranking: [SHORTCLOSED] >> [SHORTOPEN] >>*PUREQUANTITY>> **[LONGCLOSED]** >> **[LONGOPEN]**

- Learner Ranking: [SHORTOPEN]>> *PUREQUANTITY>> **[SHORTCLOSED]**>> **[LONGCLOSED]**>> **[LONG OPEN]**

8.3 The Phonologically Conditioned Pattern of Disyllabic Words

8.3.1 Cv.CVːC Pattern (10)

Linguistically, the participants should follow the same ranking adopted in trisyllabic words. The native speakers performed very successfully in locating stress in this pattern. The majority of instances chosen by the learners are accurate in perceiving the final superheavy syllable as the stress bearer

The native speakers correctly perceive the stress location due to the high ranking of the [LONGCLOSED] constraint and so do the learners who accurately perceive the superheavy syllable as the stress holder. So candidate (b) is excluded as it violates the dominant [LONGCLOSED] and results in candidate (c) being the optimal output.

Tableau 8.24: Native Speakers (Pattern 10)

/ɣa'fi:r/	LICENCESTRESS	[LONGCLOSED]	[LONGOPEN]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[NON-PERIPHERALPOSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. ɣafi:r	*!	*								
b. 'ɣafi:r		*!					*	*		
✓c. ɣa'fi:r						*	*			

However, the demotion of the [LONGCLOSED] constraint along with [LONGOPEN] below *PUREQUANTITY will promote the [SHORTCLOSED] and [SHORTOPEN] constraints in the grammar of the learners. Candidates (a) and (c) are eliminated because of violating LICENCESTRESS and [SHORTOPEN]. This provides candidate (b) as the optimal output.

Tableau 8.25: Learners: (Pattern 10)

/ɣa'fi:r/	LICENCESTRESS	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[LONGCLOSED]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. ɣa'fi:r	*!				*					
✓b. 'ɣafi:r					*		*	*		
c. ɣa'fi:r			*!	*			*			

8.3.2 CV.cvc Pattern (11) and cv.CVC Pattern (12)

The native speakers were successful in perceiving stress location in pattern (12) but failed to locate stress in pattern (11). This confirms what has been found before in trisyllabic words. The native speakers had a hard time in perceiving the location when it was intensity based stress, as other perceptual cues which are needed by the native speakers to locate stress are not obtainable here. I assume that the [INTENSITY] constraint is ranked low in the grammar of the native speakers in accordance with the ranking in the other patterns.

[LONGCLOSED] and [LONGOPEN] are not violated in the tableaux below, as these patterns lack vowel length and closed syllable with vowel length The violation of [SHORTCLOSED] has an effect over [SHORTOPEN] and excludes candidate (b) and gives candidate (c) as the optimal output. However, the same ranking is deployed by the native speakers in pattern (12) and they accurately locate the stress bearer. This shows that perceptually, the native speakers are not sensitive to the vowel quality, which attracts stress in certain phonological environments; however intuitively, they locate stress based on syllable structure cues. The closure of the syllable, regardless of the quality of the vowel, is the indicator of stress in these two patterns for the native speakers. The ranking below generates an accurate perception in pattern (12) but it leads to the misperception of stress location in pattern (11), which is consistent with the available data in Chapter 7.

Tableau 8.26: Native Speakers (Pattern 11 and Pattern 12)

A /'muriʃ/ Pattern 11	LICENCESTRESS	[CLOSELONG]	[LONGOPEN]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[INTENSITY]	[-DURATION]	[PERIPHERAL POSITION]
a. muriʃ	*!			*	*		*				
b. 'muriʃ				*!					*		
✓c. mu'riʃ					*		*	*	*		
B /ma'ħal/ Pattern 12	LICENCESTRESS	[LONGCLOSED]	[LONGOPEN]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[INTENSITY]	[-DURATION]	[PERIPHERAL POSITION]
a. maħal	*!			*	*		*				
b. 'maħal				*!					*		
✓c. ma'ħal					*			*	*		

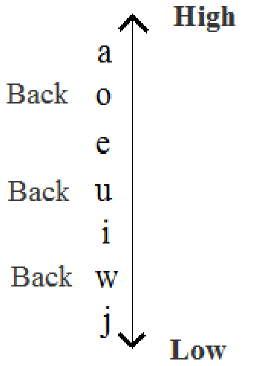
The learners performed similarly to the native speakers, in that they locate and perceive stress on the closed syllable more than the open syllable, regardless of accuracy. Chrabaszcz et.al. (2014, p.1468) compare different participants from typologically different linguistic backgrounds and found that the English speakers responded more to pitch and intensity. What makes the learners perform better than the native speakers do in pattern (11), possibly, is because they are generally more sensitive to the perceptual cues characterised by pitch and intensity.

The phonological basis for intensity is sonority. Parker (2008) found that the measurement of intensity of vowels matches the order of vowels in the sonority hierarchy, while pitch remains steady. This means that intensity is associated with the sonority of the peak of the syllable. In a way, the lower the vowel, the more intensity it holds perceptually. In terms of articulation, the position of the tongue and the movement of the tongue and the jaw gives more space in the vocal tract for the air and presumably results in a louder sound when producing /a/. Furthermore, Ladefoged (2006) and Parker (2008) find that the front vowel /u/ is slightly more sonorous than /i/ in English. I assume that the difference in Arabic vowels will be greater due to their extreme peripheral position. In fact, it is explained in Chapters 2 and 5 that in Libyan Arabic and in certain phonological environments, the low vowel is most attractive for stress assignment; but in the absence of a low vowel, the final CVC would not bear stress. Although the native speakers accurately produced these patterns, they perceptually failed to locate the stress using intensity based sonority cues, while structural cues proved to be more effective in perceiving stress.

In the first column, low vowels receive stress in the final syllable as explained before (in Chapter 3). In the third column, if a pattern such as CV.CVC lacks a low vowel in the final syllable such as in /ˈruʃin/ or /ˈħimil/, then the penultimate syllable will receive stress.

Thus, the native speakers are not perceptive to intensity based sonority cues, but they were responsive to structure cues. On the other hand, the learners are responsive to the structural cues but also to the intensity based sonority cues in which the back vowel /u/ is slightly more sonorous than /i/. Indeed, it seems they perceive a syllable with a /u/ peak as more prominent than one with an /i/ peak. Kubozono (2015) provides a vowel sonority hierarchy taken from the acoustic cue F1 and the size of the vocal tract (i.e. the position of the tongue and the openness of the jaw) in the scale below. The low vowel /a/ is the highest sonority vowel, followed by the mid vowels /o/ and then /e/, followed by the high peripheral vowel /u/ and at the bottom of the scale is the front high vowel /i/. The semi vowel /w/ is found to be more sonorous than /j/. It can be noticed from the scale in Figure (8.5) that there are two dimensions which determine the loudness of the sounds: the lower and the further back the sound, the more sonorous it is.

Figure 8.5: Sonority Scale of Vowels



Sonority Scale

The [Intensity] constraint dominates structure constraints; therefore, candidates (a) and (c) which violate [Intensity] are eliminated. In order to satisfy the [Intensity] constraint, [ShortClosed] is violated by candidate (b).

Tableau 8.27: Learners (Pattern 11)

/'muriʃ/ Pattern 11	LICENCESTRESS	[INTENSITY]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[LONGCLOSED]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. muriʃ	*!	*	*	*							
✓b. 'muriʃ			*					*			
c. mu'riʃ		*!		*				*	*		

However, the [INTENSITY] constraint does not exclude candidate (c) in the tableau below because the candidate does not violate [INTENSITY]. Other indicators are involved such as structural cues for locating stress. Therefore, the violation of [SHORTCLOSED] rules out candidate (b) and gives candidate (c) as the winner.

Tableau 8.28: Learners (Pattern 12)

/ma'ħal/ Pattern (12)	LICENCESTRESS	[INTENSITY]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[CLOSELONG]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. maħal	*!	*	*	*							
b. 'maħal			*!					*			
✓c. ma'ħal				*				*	*		

The two previous tableaux examine the accurate perception of stress by learners, but the learners misperceived the stress location in a number of instances. As a result of the demotion of the [INTENSITY] constraint, structural constraints are promoted. The optimal output will be candidate (c) that satisfies the structure cue [SHORTCLOSED]. Because of violating [SHORTCLOSED], candidate (b) is excluded.

Tableau 8.29: Learners (Pattern 11)

/'muriʃ/ Pattern (11)	LICENCESTRESS	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[CLOSELONG]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[INTENSITY]	[-DURATION]	[PERIPHERAL POSITION]
a. muriʃ	*!	*	*						*		
b. 'muriʃ		*!					*				
✓c. mu'riʃ			*				*	*	*		

- Accurate Perception → [INTENSITY]>> [STRUCTURE]
- Misperception →[STRUCTURE] >> [INTENSITY]

8.3.3 CV.cv Pattern (13), CVC.cvc Pattern (14) and CVC.cv Pattern (15)

Generally speaking, both native speakers and learners achieve a high level of perception in these three patterns. As only a minority of instances are misperceived, they are considered to be random variation, following Archibald's work (1993). Therefore, the discussion below will aim to explain the correct perception of stress in these patterns. Patterns (13) and (14) are composed of equal structures. Consequently, structural constraints including [LONGCLOSED] and [LONGOPEN] are not violated; their demotion in the learners' grammar does not affect the outcome below. Furthermore, the low ranking of [INTENSITY] in the native speakers' perception does not affect the outcome because of the requirement of MATCHSTRESS.

The tableaux below illustrates that in pattern (13), the violation of the faithfulness constraint MATCHSTRESS excludes candidate (c) and gives candidate (b) as the optimal one. In pattern (14), the [INTENSITY] constraint excludes candidate (c) and gives candidate (b) as the optimal one. In pattern (15), structure constraints have a role in selecting the optimal candidate, because this pattern is composed of unequal structures. In order to please the [SHORTCLOSED] constraint, [SHORTOPEN] is violated by the optimal candidate (b).

Tableau 8.30: Learners

A /'tˤawa/ Pattern (13)	LICENCESTRESS	[INTENSITY]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[CLOSELONG]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. tˤawa	*!										
✓b. 'tˤawa								*			
c. tˤa'wa								*	*!		

B /'maxzin/ Pattern 14	LIcenceStress	[Intensity]	[ShortClosed]	[ShortOpen]	*PureQuantity	[CloseLong]	[LongOpen]	[Non-Peripheral Position]	MatchStress	[-Duration]	[Peripheral Position]
a. maxzin	*!										
√b. 'maxzin								*			
c. max'zin		*!						*	*		

C /'ʃarba/ Pattern 15	LicenceStress	[Intensity]	[ShortClosed]	[ShortOpen]	*PureQuantity	[LongClosed]	[LongOpen]	[Non-Peripheral Position]	MatchStress	[-Duration]	[Peripheral Position]
a. ʃarba	*!										
√b. 'ʃarba				*				*			
c. ʃar'ba			*!					*	*		

8.4 Mixed Conditioned Patterns

8.4.1 CVC.cvc/cvc.CVC (Active/Passive) Pattern (16)

The first observation that can be made in perceiving stress by the two groups is that the native speakers perceive the penultimate syllable as the stress holder more often, but the learners perceive the ultimate syllable as the stress bearer in more instances. This perhaps supports the fact that despite the 100% accuracy in producing the items, native speakers are not responsive to the intensity-based sonority cue in perceiving stress; in other words, they clearly follow the rule in production but it seems that they are not aware of it in perception.

However, the learners perceive stress on the ultimate syllable, either because they are more sensitive to intensity-based sonority cue, or because of the effect of the grammatical category of the attested items. In English, verbs are most likely to be stressed on the ultimate syllable in minimal pairs. It is possible that perceiving stress on the final syllable in verbs is driven from the grammatical distribution of stress in their L1. Stress in Libyan Arabic is not distinguished in terms of grammatical category alone unlike in English, which possibly affects the decision made by the learners. Guion et. al. (2003, p.210) state that English speaking participants show an awareness of the grammatical category criteria in producing and perceiving stress in novel words in which nouns are stressed on the initial syllable and verbs on the final syllable.

As a consequence of the inactivity of the intensity-based sonority cue in the grammar of the native speakers, the [INTENSITY] constraint is ranked low as shown in the tableaux below. In Tableau 8.31, [INTENSITY] is not violated as both vowels are high front vowels.

The optimal output is candidate (b) /'niglib/ in which the penultimate syllable is the stress holder.

Tableau 8.31: Native Speakers (Pattern 16)

/'niglib/ Pattern 16 (Active)	LICENCESTRESS	[CLOSELONG]	[LONGOPEN]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[INTENSITY]	[-DURATION]	[PERIPHERAL POSITION]
a. niglib	*!										
✓b. 'niglib							*				
c. nig'lib							*	*!			

However, [INTENSITY] is ranked highly in the grammar of the learners, based on the assumption made earlier from the findings of the available data. As the learners were more reactive to the intensity based sonority cue (loudness) than the native speakers, they correctly locate stress on the final syllable in /nig'lab/ in the tableau below. Therefore, candidate (b) is eliminated because of violating [INTENSITY]; this results in candidate (c) being the optimal output.

Tableau 8.32: Learners

/nig'lab/ Pattern 16 (Passive)	LICENCESTRESS	[INTENSITY]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[LONGCLOSED]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. niglab	*!										
b. 'niglab		*!						*			
✓c. nig'lab								*	*		

However, the problem is not entirely solved because in tableau 8.33 below, candidate (b) is the optimal candidate but it is not the actual outcome as the learners incorrectly perceive the stress on the final syllable more often than on the initial syllable in this pattern. This does not preclude the fact that they rely on the intensity-based sonority cue, but rather it adds another factor that affects the perception of stress into the computation. That is, the grammatical class of the words.

Therefore, the CLASS constraint will be introduced to require that final syllables in verbs can hold stress, while initial syllables hold stress in nouns. This will exclude candidate (b) and allow candidate (c) to be the optimal candidate as shown below.

Tableau 8.33: Learners

/'niglib/ Pattern 16 (Active)	LICENCESTRESS	CLASS	[INTENSITY]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[CLOSELONG]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. niglib	*!											
b. 'niglib		*!							*			
✓c. nig'lib									*	*		

The native speakers inaccurately perceive the penultimate syllable as the stress holder in a word like */'nig.lab/. Based on the available data, the native speakers are not reactive to the class cue, as it is not a part of the grammar of the language. Moreover, they are not sensitive to the intensity-based sonority cue either, despite its effectiveness in a range of disyllabic patterns in the language. However, they prove to be highly perceptive to the structure cue, but this cue does not play a role here as this pattern is composed of two closed syllables. Therefore, one might assume that in the absence of the structure cue and as the final syllable is not a default location in Libyan Arabic, it is less stressed than the penultimate syllable.

8.4.2 CVC.cvc/cvc.CVCC (1st and 3rd Person, Past, masculine) Pattern (17)

Similar to pattern (16) and in accordance with the above scenario, the learners perceive the final syllable as the stress bearer. If the above ranking applied to both forms of this pattern, we would expect that the candidates with final stress assignment would be the optimal ones. Therefore, the CLASS constraint outranks the [INTENSITY] constraint and expels candidate (b) but optimises candidate (c), as it satisfies the requirement of the CLASS constraint.

Tableau 8.34: Learners

/'baddil/ Pattern 17 (3rd Person)	LICENCESTRESS	CLASS	[INTENSITY]	[SHORTCLOSED]	[SHORTOPEN]	*PUREQUANTITY	[CLOSELONG]	[LONGOPEN]	[NON-PERIPHERAL POSITION]	MATCHSTRESS	[-DURATION]	[PERIPHERAL POSITION]
a. baddil	*!											
b. 'baddil		*!							*			
✓c. bad'dil			*						*	*		

It can be noticed in tableau (8.35) below that because of the requirement of the CLASS constraint, candidate (b) is excluded. Although the violation of [INTENSITY] is not tolerated, it is violated in order to satisfy CLASS and gives candidate (c) as the optimal one in accordance with the results found in this study.

Tableau 8.35: Learners (pattern 17)

/'baddilt/ Pattern 17 (1st Person)	LicenceStress	CLASS	[Intensity]	[ShortClosed]	[ShortOpen]	*PureQuantity	[LongClosed]	[LongOpen]	CLASS	[Non-Peripheral Position]	MatchStress	[-Duration]	[Peripheral Position]
a. baddilt	*!												
b. 'baddilt		*!							*	*			
✓c. bad'dilt			*							*	*		

On the other hand, the native speakers perceive this pattern more accurately than other verbs. First, the native speakers contrast with the learners who perceive the initial syllable as a stress holder more frequently, except where the final syllable is composed of a consonant cluster as in the CVC.CVCC structure. The native speakers are not responsive to the intensity cue and class cue. Consequently, in the tableau below, both constraints are low-ranked in the native speakers' grammar; this gives candidate (a) as optimal.

Tableau 8.36: Native Speakers (Pattern 17)

/'baddil/ Pattern 17 (3rd Person)	LicenceStress	[LongClosed]	[LongOpen]	[ShortClosed]	[ShortOpen]	*PureQuantity	[Non-Peripheral]	MatchStress	[Intensity]	[-Duration]	[Peripheral Position]	Class
✓a. 'baddil							*					*
b. bad'dil							*	*!	*			

In the 1st person form (in Tableau 8.37), what optimises candidate (c) is not only the low ranking of Class and [Intensity], but also the violation of the faithfulness constraint MatchStress which excludes candidate (b). Moreover, the cue which is not listed in the above ranking but which contributes to the shift of the choices of the native speakers in perceiving the final as stress bearer is the structure of heavy syllables which is composed of CV:C or CVCC. One might think that this cue is in a way redundant. In fact, it is not; because without involving the Close-By-Cluster constraint, the violation of [ShortClosed] constraint will exclude the actual output candidate (c).

In Tableau 8.37 below, there is no domination relationship between Close-By-Cluster and CloseLong; both are highly ranked in the native speakers' grammar. The violation of Close-By-Cluster excludes candidate (b). ShortClosed is violated in order to satisfy the Close By Cluster constraint and results in candidate (c) being optimal. The learners and the native speakers agree on perceiving stress on the final syllable in the CVC.CVCC structure, possibly depending on different cues to achieve the same result.

Tableau 8.37: Native Speakers

/bad'dilt/ Pattern 17 (1st Person)	LicenceStress	[LongClosed]	Close-by-cluster	[LongOpen]	[ShortClosed]	[ShortOpen]	*PureQuantity	[Non-Peripheral Position]	MatchStress	[Intensity]	[-Duration]	[Peripheral Position]	Class
a. baddilt	*!												
b. 'baddilt			*!					*	*				*
✓c. bad'dilt					*			*		*			

8.4.3 CVC.cvc/cvc.CVC (Imperative/ 3rd Masc Past) Pattern (18)

This pattern is similar to pattern (16) where the final syllable is stressed when it contains a low vowel, while the initial syllable is stressed when the final one lacks a low vowel. In fact, both the CLASS and INTENSITY constraints are ranked high in the learners' grammar. CLASS outranks INTENSITY in a dominant relationship. Therefore, in a word like /*bad'dil/, the learners perceive the final syllable as the stress carrier, as it is a verb. However, the learners were unsure about perceiving the stress in a word like /ʔazʕil/. The number of instances is equal in both syllables (Chapter 7). Does this mean that the relationship between the two constraints is not a dominant one? If this correct, then this might justify why the learners perceive both positions as stress bearers.

However, if this assumption about the lack of the dominant relationship is correct, then why did the learners choose the final syllable in pattern (17) as in /*bad' dil/ and what confused them and made them uncertain about the stressed syllable in /ʔazʕil/ in pattern (18)? Can one claim that there is a dominant relationship but that other aspects affect the perception of stress, namely geminate consonants? In /*bad'dil/, a geminate consonant triggers the perception of the final syllable as the stressed syllable. The learners in their production stress the final syllable when the geminate consonants are maintained, but stress the initial one when the geminate coda is deleted as /*'ba.dil/ and /bad'dil/. So one possibly suggests that preserving the geminate forces stress to be assigned on the final syllable, while losing the geminate in the coda keeps the stress in the initial position. However, this is an immature analysis that needs further study to support or decline this assumption.

However, let us summarise the main points that might affect the perception of stress in mixed conditioned patterns in order to derive a ranking of constraints that determines the participants' perception. In (16), the class cue takes over and locates stress on the final syllable, as a high front vowel occupies the peak of both syllables. In (17), if there is no dominant relationship between class and intensity, the final syllable is perceived as the stress bearer because of the effect that the geminate consonant has on perception and production of stress. Therefore, perhaps the learners perceive the stress on the final syllable when they hear the geminate consonants. In (18), the uncertainty of the perception of stress in this pattern can be explained if there is a non-controlling relationship between CLASS and INTENSITY, as can be seen below.

Tableau 8.38: Learners (Pattern 16 - Active)

Pattern 16 /'niglib/	CLASS	[INTENSITY]
a. 'niglib	*!	
✓b.nig'lib		

Tableau 8.39: Learners (Pattern 17- 3rd person)

Pattern 17 /'baddil/	GEMINATE	CLASS	[INTENSITY]
a. 'baddil	*!	*	
✓b. bad'dil			*

Tableau 8.40: Learners (Pattern 18- Imperative)

Pattern 18 /'ʔazʕil/	CLASS	[INTENSITY]
→a. 'ʔazʕil	*	
→b.ʔaz'ʕil		*

In pattern (18) in the past form where the stress is assigned on the ultimate syllable, the learners accurately perceive the final syllable as the stress carrier where both CLASS and INTENSITY are satisfied. Candidate (b) violates both of them so it is out, but candidate (c) obeys them and wins as the optimal actual output as illustrated below.

Tableau 8.41: Learners: (Pattern 18- Past Form)

Pattern 18 ʔiz'ʕal	GEMINATE	CLASS	[INTENSITY]	MATCHSTRESS
a. 'ʔizʕal		*	*!	
√b. ʔiz'ʕal				*

In the native speakers' grammar, CLASS and INTENSITY constraints are not active so they are low-ranked. In accordance with the constraint demotion theory (Tesar and Smolensky (1993, 1998, 2000), constraints are demoted but not promoted. This study challenges this, because the native speakers did not reach top levels of accuracy in perceiving all the patterns. Their ranking will therefore be different from the theoretical ranking, so demotion is not always guaranteed. However, in order to demote one constraint, another one has to be promoted. This means that the faithfulness MATCHSTRESS is ranked higher than CLASS and [INTENSITY] in the native speakers' grammar, but it is demoted and outranked by CLASS and [INTENSITY] in the learners' grammar as illustrated in Tableau 8.42. Candidate (b) is eliminated due to the violation of MATCHSTRESS, allowing candidate (b) to be the optimal one as shown below.

Tableau 8.42: Native Speakers (Pattern 18-Imperative)

/ʔazʕil/ Pattern 18	MATCHSTRESS	CLASS	[INTENSITY]
✓a.'ʔazʕil		*	
b. ʔaz'ʕil	*!		*

One more point is that the native speakers did not perceive stress on the final syllable in verbs involving equal syllable structures. Therefore, a proposed constraint is *CLASS that does not accept the grammatical class as a cue for stress. This constraint is derived from the fact that the native speakers perceived the penultimate syllable as the stressed syllable in nouns in pattern (14) CVC.CVC, as shown in Chapter 7 and also perceived verbs with stress on the penultimate syllable as the grammatical class does not make a difference. However, the English speaking group showed a different pattern; they perceived nouns which have a structure of CVC.CVC with penultimate stress and verbs with the same structure of CVC.CVC with ultimate stress. Therefore, CLASS outranks *CLASS (No CLASS) in the learners' grammar while the opposite ranking occurred in the native speakers. This will exclude candidate (b) as it violates *CLASS in order to satisfy CLASS, while candidate (b) wins as it satisfies the former.

- The learners' grammar → *CLASS>>CLASS
- The native speakers' grammar → CLASS>>*CLASS

Tableau 8.43: Native Speakers (Pattern 18- Past Form)

/ʔizˈʕal/ Pattern 18	*CLASS	MATCHSTRESS	CLASS	[INTENSITY]
✓a. ˈʔizʕal		*	*	*
b. ʔizˈʕal	*!			

8.5 Summary and Conclusion

There is not a clear agreement between production and perception because the participants did not produce what they perceived in all the patterns but it can be noticed that some of the results in the perception mirror those in production. It has been found that reaching the top limit of accuracy in perception of stress by native speakers has not been achieved in the current study. This provides evidence that 100% accuracy in production does not lead automatically to 100% accuracy in perception. It has also been proved in other studies, where the native speakers were not able to perceive stress location straightforwardly and locate it accurately (Taylor and Hellmuth 2012). In fact, the level of accuracy in perceiving stress varies based on the functional load of stress in the L1 (Kijak 2009; Altmann 2006). In this study, participants perceive the location of stress based on a number of cues. Both groups respond to these cues differently; these cues stimulate the constraints that are perhaps responsible for the stress perception in their grammar. The cues that are adopted are: structure cues, auditory cues, peripheral cues and class cues which interact with marked and faithfulness constraints.

Cue Constraints:

Structure Cue:	**Auditory cue**	**Class Cue**	**Markedness Constraints:**
[LongClosed] [LongOpen] [ShortClosed] [ShortOpen] [Close-By Cluster] Geminates	[Intensity] based Stress [Intensity] based Sonority [-/+Duration]	*Class Ciass	LicenceStress *PureQuantity

Peripheral Cue:	**Faithfulness Constraints:**
[Non-peripheral Position] [Peripheral Position]	MatchStress

Below there are three rankings: the model ranking that should theoretically be adopted by the native speakers in perceiving stress because it leads to the accurate perception of stress that matches production, but from which theoretical paradigm the native speakers diverge.

Comparing the ranking adopted by the native speakers with the theoretical one, it can be noticed that the [Intensity] constraint is controlled by structure cue constraints in the native speakers' grammar, which leads to misperceiving patterns that lack length or closure. Based on the available data, the native speakers proved that they could not perceive the location of stress in intensity-based sonority or intensity-based stress patterns.

However, the learners are able, to some extent, to perceive intensity-based stress patterns more than the native speakers. It can be noticed that learners are not very responsive to the structure cues compared to the native speakers. Furthermore, the presence of vowel length, or length combined with closure, is not a major stress indicator for the learners. I suppose this is connected to the markedness constraint *PUREQUANTITY; the learners are not responsive to the vowel quantity that is identical in its quality. Inability to perceive stress on [LONGOPEN] and [LONGCLOSED] occurs because these constraints are outranked by *PUREQUANTITY. However, the [SHORTCLOSED] cue is respected by the learners but it is controlled by other constraints such as CLASS and [INTENSITY].

Another major difference is the effect of the grammatical category of words. The learners are reactive to the position of stress and the grammatical category of the words but the native speakers show no response to these grammatical distinctions. So the CLASS constraint outranks *CLASS in the learners to give rise to particular categories of words having stress on particular positions. However, *CLASS controls CLASS because the native speakers do not acknowledge that grammatical category determines the stress position.

It can be noticed in the rankings that LICENCESTRESS occupies the same level in the ranking below; however, [LONGOPEN] and [LONGCLOSED] are demoted and outranked by [SHORTCLOSED] and *PUREQUANTITY. It can also be noted that MATCHSTRESS is also demoted and outranked by CLASS and [INTENSITY] in the learners' grammar.

8.5.1 Ranking of Constraints

8.5.2 Theoretical Ranking

Below is the theoretical ranking that yields an accurate perception of stress that matches the production of the native speakers; as mentioned earlier, the native speakers and the learners deviate from this ranking.

LICENCESTRESS >> *CLASS >> [INTENSITY] >> [LONGCLOSED], [CLOSE-BY-CLUSTER] >> [LONGOPEN]>> [SHORTCLOSED] >> [SHORTOPEN] >> *PUREQUANTITY >> NON-PERIPHERAL POSITION >> MATCHSTRESS >> [-DURATION] >> PERIPHERAL POSITION >> CLASS >> GEMINATES.

8.5.3 Ranking of Constraints for Native Speakers

LICENCESTRESS >> *CLASS >> [LONGCLOSED], [CLOSE-BY-CLUSTER] >> [LONGOPEN]>> [SHORTCLOSED] >> [SHORTOPEN] >> *PUREQUANTITY>> NON-PERIPHERAL POSITION >>MATCHSTRESS >> [INTENSITY] >> [-DURATION] >> PERIPHERAL POSITION >> CLASS >> GEMINATES.

8.5.4 Ranking of Constraints for Learners

LICENCESTRESS >> GEMINATES >> CLASS, [INTENSITY] >> [SHORTCLOSED] >> [SHORTOPEN] >> *PUREQUANTITY >> [LONGOPEN] >> [LONGCLOSED], [CLOSE-BY-CLUSTER] >>NON-PERIPHERAL POSITION >> MATCHSTRESS >> [-DURATION] >> PERIPHERAL POSITION >> *CLASS.

The current chapter is an attempt to analyse and to construct a ranking of constraints that can govern the perception of stress by the learners as well as the native speakers, based on the data and findings of this study. In the next chapter, I will attempt to provide a brief summary of the findings of this study and highlight its contribution to the field of Linguistics.

9 Summary and Conclusion

This thesis addressed the production and perception of stress in isolated words by uninstructed adult English-speaking learners of Arabic. It also focused on the perception and production of stress by native speakers. Two major areas were investigated: first, I ascertained the stress patterns on which the learners and the native speakers were accurate/inaccurate when producing and perceiving stress. Secondly, I developed a ranking of OT constraints that accounts for their accurate and inaccurate production and perception responses. This ranking describes/generates the forms actually produced or perceived. The study focused on three contextual criteria for stress placement in LA: syllable position, syllable structure (including syllable openness, vowel length and height), and grammatical category. This study looked at the choices the learners have available to them in their interlanguage: transfer their L1, apply the L2 or adopt patterns that are not part of either the L1 or the L2, which might be a result of universal or developmental effects. It also focused on L1-L2 similarity and differences and whether the learners would have access to the predictable patterns as well as the unpredictable ones in accordance with H3 (in Chapter 4).

In order to obtain the data for this, the native speakers and the English speaking learners were asked to take the same tests and follow the same procedures in both a picture naming task and a stress identification task. The discussion of the findings was mainly conducted within the Optimality Theory framework, with reference to Metrical Parameter Theory in the explanation of Libyan Arabic stress (in Chapter 3).

9.1 Summary of Main Findings

Native speakers achieved the top accuracy rates in production, in accordance with the stress paradigm of LA, but they failed to achieve the same success in the stress perception tasks. The English speaking learners were successful in the production and perception of some patterns but they had some difficulty in others.

9.1.1 Perception

My intention was to contribute to the understanding of which cues (represented in constraints) determine stress perception. We found that the misperception of stress was not restricted to the L2 learners, but rather that the complexity of stress perception of stress affects the native speakers themselves. Therefore, it was difficult to refer to the L2 target when the native speakers themselves could not achieve it and were even outperformed by the learners in some patterns. Stress perception is affected by the ability to recognise stress indicators in the language, which depends on the functional load of stress (i.e. the information related to stress) in a mother tongue. This can have an effect on either the L1 or L2 (Peperkamp and Dupoux 2002; Kijak 2009).

English speaking participants outperformed the native speakers in some patterns where they exploited cues found in Libyan Arabic better than the native speakers did. In fact, when the learners outperformed the native speakers in patterns (5) and (6), the majority of instances were inaccurately perceived, but the number of learner instances perceived with accurate stress assignment in these patterns exceeds the native speakers' responses. Thus the numerical trends show that the learners paid more attention to the loudness (intensity based stress) than the native speakers did. Therefore, the [INTENSITY] constraint is ranked higher in the grammar of the English speaking participants compared to the native speakers. This can be attributed to the fact that the word stress information which is available in English, when words can be recognised through stress, is more functional than the information available in Libyan Arabic. The word stress information in English words needs to be perceived in order to distinguish which word is being heard far more often than in Libyan Arabic, where only a small list of words are distinguished by stress alone.

However, in our findings, the native speakers are shown to have recourse to vowel quantity in order to recognise stress. In Libyan Arabic, if a vowel quantity distinction is present in the word, the long vowel (more often than English) will attract stress. Therefore, the native speakers either exhibited a ceiling effect in accuracy or achieved a highly significant result in patterns (7), (8), (9), and (10) where a distinction between vowel quantity was a key stress indicator. In our OT analysis, [LONGOPEN] and [LONGCLOSED] are therefore ranked high for native speakers while [*PUREQUANTITY], which rejects the pure vowel quantity distinction as a stress cue, is ranked low. It seems that this cue has much less effect on the perception of stress by the learners. Both groups used syllable structure as a cue for stress, but they targeted different structures. The learners targeted CVC syllables as they are perceived as a stress holder more often than the CVːC and CVː structures; for them, [SHORTCLOSED] therefore outranks [LONGOPEN] and [LONGCLOSED], which is the opposite in the native speakers' performance. It is difficult to decide which ranking is more universal (unmarkedness) because [SHORTCLOSED], [LONGOPEN] and [LONGCLOSED] use weight as stress indicators. So one might say that they are universals but their ranking is language specific and based on the listeners' perception.

Moreover, grammatical category affected stress perception of stress in the learner group. This can be attributed to the fact that some stress patterns in English are lexically encoded in minimal pairs of nouns and verbs. Therefore, a distinction between the verbs and nouns was observed in the learners' performance (Patterns (14), (16) and (18)). Hence, the CLASS constraint which demands this distinction is highly ranked in their phonology, but has no effect on the native speakers' grammar.

To sum up, the main aspects that affected the perception of stress were syllable position and syllable structure. The learners were more responsive to the penultimate syllable, especially if it was composed of the target CVC syllable, whereas the native speakers were responsive to the penultimate and the ultimate syllables. This was duplicated in disyllabic words, but the leaners did not choose the correct syllable significantly more than the incorrect one. The learners were also more responsive to intensity based sonority and grammatical category cues. The participants in both groups value syllable weight as a stress indicator and this supports H 2, while the use of grammatical category as an indicator is transferred from the L1 (H 3-1).

9.1.2 Production

Both languages employ trochaic stress in a quantity sensitive system with parsing which starts from the right and ends in selecting the rightmost foot to be stressed, provided it is not extrametrical. Despite this similarity in the surface structure in regular patterns in both languages, the learners were not successful in the production of all patterns. The learners were significantly successful in phonologically conditioned regular patterns such as (3), (4), (13), (14) and (15) (as FOOT-BINARITY, TROCHEE and PARSE are ranked at a similar level in both grammars) but significantly unsuccessful in irregular patterns such as (5), (6) and (11). However, in patterns (1), (7) and (8) the learners were only marginally successful; these patterns were predictable by regular phonological patterns, but this reduced performance possibly occurred because of the effect of other factors such as vowel quantity and syllable structure. The numerical trends showed that although the majority of instances were produced with accurate stress assignment, the correct syllables were often not stressed significantly more than the incorrect ones.

The learners failed to correctly stress the final syllable in nouns in patterns (9) and (10) (as WSPμμμ is not a dominant constraint in their grammar) – this is a feature of their IL (phonology) but not in pattern (12) as a result of WSP >> NON-FINALITY σ. This performance recalls the above scenario in perception, whereby for the learners there are two preferred criteria (syllable position, penultimate and syllable structure, heavy syllable CVC) and if they are met, then the accuracy of performance would reach the ceiling as in pattern (15). If not, then the learners might show uncertainty or produce stress in accordance with the predictable quantity sensitive stress patterns in the L1 and L2. It was found that there was an interaction between closure and openness of the syllable and the length of vowels, providing evidence that certain syllable structures have priority over others for being stressed in accordance with quantity sensitivity.

To sum up, there is no clear cut answer as to whether the learners correctly adopted the L2 forms or positively transferred the L1 forms when they produced the regular patterns such as (3), (4), (13), (14), (15)), but there is evidence that unpredictable L1 or L2 forms (e.g. patterns (5), (6), (11)) are not accessible in L2 production, so predictable L1 and L2 patterns are used instead. Moreover, L1 forms can be transferred to the L2 when there are no overt equivalent patterns in the L1 or L2 (e.g. patterns (16), (18), and (14)). That is where the learners made a distinction between verbs and nouns in terms of stress position in the L2 as a result of NON-FIN σ NOUN. These patterns provide some support to H 3. PEAK PROMINENCE- FINAL σ constraint controls the native speakers' production when vowel height affects stress in patterns (11) (12), (16) and (18) but it does not play a role in the learners' production because syllable weight was the deciding factor in patterns (11) and (12), as it is a more universal trend in determining stress in quantity sensitive languages, while the effect of the syllable peak is language specific.

9.1.3 Relation between perception and production of Stress

Researchers have not hitherto paid attention to the relationship between stress production and perception. One of the main contribution of this study is to examine this relationship based on the participants' performance. It seems that there is no direct relationship between good production and perception, because the native speakers misperceived stress but did not make production errors, and consequently production does not match perception in certain patterns. Based on the learners' performance, the relationship between perception and production is inconsistent. The success rate of producing some patterns is not always matched with the success rate in the perception task. Regardless of accuracy, the learners produced what they perceived as the stressed syllable in a number of patterns such as (3), (4), (5), (6), (7), (13), (14) and (15). However, they did not produce what they perceived to be the stressed syllable in patterns such as (2), (9), (10), (11) and (12). It seems that the learners' perception and production of stress is matched in some cases when the learners stressed syllables that have default structure and occupy the default position. To sum up, accurate production does not automatically lead to accurate stress perception, as the native speakers in this study were not able to hear the stress despite their ability to correctly produce the stressed syllables. It seems that good production does not entail good perception and bad perception does not entail bad production in the stress of L1 and L2. (Cf section 9.2).

9.2 Implications

As mentioned in section (9.1.3), a major contribution of this study is to find out that perfect L1 production does not correspond automatically to perfect L1 perception; this behaviour also seems to extend to the L2. The participants perceived what they produced in a number of patterns, which implies an agreement between perception and production; however, this performance was not consistent in all patterns because some patterns such as (5), (6), (1), (11), (16 b), (17 a) and (18 b) elicited the opposite performance in the native speakers' performance, whereby the responses in perception did not correlate with stress assignment in the production task. This means that the relationship between production and perception of stress is not straightforward and one of them does not imply the other, supporting the findings of Altmann (2006) and Kijak (2009). Thus, it is not necessarily that native speakers or learners perceived what they produced regarding to the position of stress in a word.

The scope of Optimality Theory to account for stress perception in English-speaking learners of LA was extended in this study to capture the gap between the perception of stress and phonological theory. In that sense, using Optimality Theory in relation to perception was handled by referring to stress indicators (cues). These cues are represented as constraints to govern the responses made by the participants in choosing the stressed syllable. An attempt was made to capture the listeners' awareness of the indicators that are represented in the connection between the auditory form and the surface form (Chapter 7). This type of investigation is limited in the field of phonology, but has been proved to be successful in the current study. Participants perceive the location of stress based on a number of cues. Both groups respond to these phonological cues differently; these cues stimulate the constraints that are perhaps responsible for stress perception in their grammar.

This study supports some findings of previous studies: transfer has a role, not only in production but also in L2 perception (Flege, 1995; Best, 1995). In the current study, it was found that the CLASS constraint affects stress perception and the NON-FIN σ NOUN constraint affects production (patterns (14), (16) and (18)); however, neither constraint plays a role in the native speakers' performance. This also confirms (H 3): if the stress patterns do not exist in the L1, then an L1 negative transfer effect may appear in the L2. However, this finding contradicts Archibald (1993) who found that stress production is more influenced by transfer than stress perception (see Chapter 2). Errors in the L2 are due not only to transfer, but also to markedness and universal grammar. Broselow et. al. (1998), Pater (1997) and Archibald (1997) found that learners were able to use an unmarked pattern that was not a part of their L1 or L2. The results of the study also show that the learners might have recourse to a pattern that is part of neither the L1 nor the L2, but a universal trend normally adopted by children. This was found when some learners stressed the leftmost syllable as a result of the ALIGNLEFT constraint, as found in Louriz's (2004) work (e.g. patterns (2), (3) and (9)). Another claim is that an interaction between transfer and markedness occurs in the interlanguage of L2 learners (Major, 2008). This is supported in this study through H3-1: if the stress patterns match in the L1 and L2, are unmarked and follow regular phonological conditions, the prediction is that learners should get these patterns right by just applying the predictable/unmarked patterns (patterns (3), (4), (7), (8), (13), (14) and (15)). Similar findings were reported by Youssef and Mazurkewich (1998). H3-2 predicts that if the stress patterns are similar but applied differently and they are considered marked as they contradict predictable patterns, then these unpredictable patterns are not accessible in the

L2 despite their partial availability in the L1. This finding is supported in this study in patterns (5), (6), (9), (10) and (11). A similar finding was reported in Jleiyal's (2004) work.

The current study is the only study that I am aware of that provides empirical evidence for LA stress patterns from two perspectives: perception and production. It also sheds light on the issue of LA stress perception by adults. Most importantly, this study raises awareness of testing methods of stress perception. The current study followed and adopted the methods used by a number of researchers, namely Archibald (1993); Altmann (2006) and Kijak (2009) in perception tasks (an identification task).

According to Kijak (2009), the identification task was the preferred method to test perception because the aim is to get information about phonological representations and it should not be purely influenced by acoustics, which was helpful in the current study in order to elicit the stress indicators used by the participants. Beddor and Gottfried (1995) claims that that identification tasks are ideal for testing linguistic representations. Kijak (2009, p.133) confirms by saying ''It is suggested that identifying a feature (stress in this case) requires subjects to store the information in a linguistic representation, while for example a simple discrimination task could be done purely on the basis of acoustics. Identification also seems to be a more natural task occurring in the linguistic reality of a speaker's everyday life, while discrimination, for example, may seem in that context a bit more of an artificial or 'unnatural' task''. If we accept this, it suggests, as mentioned earlier, that a failure to correctly perceive stress, especially by native speakers, is due to underlying language competence and the functional load of stress in the L1.

However, saying a word in isolation to name a picture is more like a real life language task, focussing on the word and its meaning rather than its form: there are scenarios in which we might ask a small child to describe a picture. But, in real life language use, we almost never ask people where the stress is in a word that they hear. In this case, the focus is on the word form rather than its lexical meaning. Arguably, the perception task required more metalinguistic awareness/competence as they have to have (or develop) a concept of stress which they may not already explicitly have (only intuitively), while production tasks could be done using spontaneous inexplicit knowledge/competence as they do not need to have any conscious idea of stress to do the task. It is possible that monolingual native speakers have less of this knowledge than bilingual non-native speakers. A more intuitive and realistic perception task would be one with focus on what word a participant hears rather than where the stress is located.

Alternatively, a suggestion mentioned earlier is that the native speakers are simply reflecting the fact that misperceiving stress in LA is hardly ever going to result in a misunderstanding, as minimal pairs differ in grammatical status, so the context would nearly always make the meaning clear. Hence, they do not need the spontaneous competence to correctly perceive it to the same extent that they need it to correctly produce it (the functional load of stress). The production task calls for the speaker to tap into her more spontaneous, implicit, competence while the perception task calls for her to be more aware, and use metalinguistic competence. It is difficult to provide clear cut evidence as to whether the failure was due to performance or competence. Reduplication of the perception aspect of the task for the native speakers using another type of task might provide some explanation and avoid possible effects of the elicitation methods.

9.3 Limitations

Despite the researcher's effort to execute this study in a valid and reliable way, there were some limitations that could not be avoided.

First, the number of the participants of the main group, the English speaking learners of Arabic was limited due to the difficulty in finding participants who could meet all the criteria set for this study. Furthermore, although their level of proficiency was measured at the beginning of the study, it was not used as a variable in the study. Ideally we would have had enough participants to be able to distinguish and compare groups of different proficiency levels and hence study the process of stress acquisition by learners over time. In Chapter 6 however, we did refer to participants' individual performances. The number of the native speakers group was determined based on the number of the learners.

Second, there are some concerns regarding the stimuli used. There was an attempt to include as many patterns as possible and vary them based on similarity/dissimilarity and regularity/irregularity between the two languages, with each pattern represented by the same number of word tokens. However, some items had to be excluded from the study because they were not known by the learners, which meant that in the end we had unequal numbers of words for each pattern.

Third, in the production task procedure, the researcher had to intervene on different occasions to help the English speaking learners produce the target word without pronouncing the word; this is because some words have synonyms and because it is sometimes difficult to prompt learners to produce the exact inflected verb form . It is difficult, however, to see how this problem could be avoided.

Fourth, production and the perception were analysed phonologically, but it would be ideal if a phonetic analysis accompanied the phonological analysis to phonetically confirm the acoustic cues of stress. Such an analysis would be useful, but due to the space and time limitations of this work it was difficult to extend the study to this level of investigation.

Fifth, the focus was only on primary stress, but extending the discussion to include secondary stress would possibly assist in the analysis of some trisyllabic patterns. Sixth, looking at stress in words in a sentence context rather than in isolation might be useful, but following Altmann's work (2006) work and due to the difficulty of unifying the sentences (as the learners are not able to read), this would result in an unsystematic and unified list of sentences into which the learners would be asked to put the items produced in a sentence of their choice.

9.4 Suggestions for Further Research

Aside from suggestions implicit in the account of limitations above, we propose the following. This study presents an investigation of stress patterns in production and perception by learners and native speakers of LA, and formulated phonological constraints within OT which govern the patterns. However, a number of issues arose which have not been resolved and might suggest some directions for future research.

First, a wider picture could be obtained by including other regular and irregular LA stress patterns which are comparable and only differ in the stress position such as CV.cvc.cvc /ˈma.lik.hum/ *their king* and cv.CVC.cvc /ma.ˈlik.hum/ *he owned them*; CVC.cv /ˈwal.la/ *he came back* and cvc.CV /wal.ˈla/ *is n't it?* and by including items with long vowels in the penultimate position in disyllabic words such as /ˈmaːlik/ *owner*.

Secondly, the learners showed a sensitivity to some speech segments such as geminate consonants in verbs, which possibly affects stress information and pushes stress onto another syllable when the geminate consonants are maintained. Research therefore needs to be done comparing patterns which are identical except for the presence of geminate consonants, versus two non-identical consonants.

Third, vowel quantity is another issue that affects (to some extent) the production and the perception of stress by the learners especially in closed syllables; further study is needed to confirm whether or not this distinction is difficult to perceive and if this distinction is very minimal because the vowels share exactly the same quality.

Fourth, in this study the learners showed more sensitivity in perception to the intensity of stressed syllables with no vowel length or syllable closure as stress indicators, but the native speakers showed more sensitivity to vowel quantity which was a major stress indicator. This distinction needs further investigation based on L1 stress properties and the functional load of stress in each language.

Fifth, apparently quantity sensitivity is a very important factor and it is found to be a dominant feature in the performance of the learners in production and of the native speakers in perception. Does this mean that it is unmarked and a universal that is generally used as a default property? It would be interesting to test participants who speak quantity insensitive languages and see whether or not they would exhibit quantity sensitivity.

Finally, it would be interesting to see if the same results would be elicited if participants who received formal classroom instruction were included.

This work leads to a general conclusion that L2 stress is complicated beyond the properties of the learners' L1: English has a partially predictable stress system while LA has a partially unpredictable stress system, which means that English stress is more complex than Arabic stress, but this did not help the learners. Moreover, the complexity of stress affects the perception even of the listeners' mother tongue.

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Appendix (1): Questionnaire

1. Participant Number:………………………Group:…………………………………….
2. Age:…………………………… Place of birth:………………………………………
3. Level of Education…………………………………………………………………….
4. Length of Residence in Libya…………………………………………………………
5. The region which you grew up in …………………………………………………….
6. Have you lived outside the region where you were born and grown up? YES NO

If YES : Where? …………………………… For how long? ……………………….……

7. What is the first language of your parents? Mother …………Father ………………….
8. Knowledge of other Languages ………………………………………………………

   If YES: Which?...

9. How old were you when you first learned the other language (including LA for Non-native speakers)?..
10. How did you learn the other language including Arabic for (non-native speakers)?

    Circle: Family (children and Husband) --Friends and neighbours – TV programmes

    Arabic Music – Self-study – Others please specify………………………………….

11. How often do you speak it (including Arabic)?...
12. How often do you hear it (including Arabic)?..
13. Have you lived in any other Arabic-speaking countries? YES NO

If YES: Where? ………………………………..For how long?.......................................

14. Please evaluate your level of proficiency of Arabic and other languages (if any):

    Arabic: 1) Native-like 2) different from native-like 3) hardly understandable 4) Unintelligible

    Other languages: 1) Native-like 2) different from native-like 3) hardly understandable 4) Unintelligible

استبيان

1- رقم المشترك................ المجموعة ....
2- العمر .... مكان الولادة ....
3- المستوى التعليمي ....
4- مدة الاقامة في ليبيا ....
5- المنطقة التي ترعرعت فيها ....
6- هل سبق لك ان عشت خارج المنطقة التي ولدت وترعرعت فيها ؟ نعم أو لا إذا كانت الإجابة بنعم ؟ أين تقع المنطقة؟ .... وكم الفترة التي عشتها هناك؟ ....
7- ماهي أول لغة لوالدك والدتك؟ ....
8- هل لديك لغات أخرى؟ .... إذا كان بنعم؟ ما هي اللغات؟...
9- كم كان عمرك عندما تعلمت اول لغة اجنبية؟ ....
10- كيف تعلمت اللغات الاجنبية؟ ضع خط تحت الخيارات التالية .. العائلة – الأطفال – الزوج او الزوجة – الأصدقاء – الجيران – التلفاز – الأغاني– الدراسة – طرق أخرى .
11- لو سمحت قيم مستواك في اللغات الأخرى التي تجيدها (إذا وجدت) بأحدى المستويات التالية :-

مستوى عالي .... مستوى متوسط ....مستوى ضعيف

Appendix (2): Criteria of the Oral Conversational Test

Criteria : Oral Exam	Pronunciation:	Fluency	Coherence	Grammatical Range	Lexical Resources
5/ B2	Uses some effective pronunciation features and can be generally understood.	Speaks at length without noticeable effort sometimes with some self-correction.	Uses a range of connectives and discourse markers appropriately.	Uses a mix of simple and complex sentences.	Has vocabulary to discuss topics and make meaning clear.
4/B1	Shows some effective use of pronunciation features with mixed control; it is not always sustained.	Usually maintains flow of speech but uses repetition, self-correction and/or slow speech to keep going.	Uses connectives and discourse markers but not always appropriate-ly.	Uses a limited range of complex structures, but these usually contain errors.	Uses vocabulary with limited flexibility and manages to talk about familiar topics.
3/A2	Generally be understood but mispronunciation of individual words or sounds reduces clarity at times.	Produces simple speech fluently, complex communication causes fluency problems.	May over-use certain connectives and discourse markers.	Produces basic sentence forms and correct simple sentences.	Can only convey the basic meaning with limited vocabulary.
2/A1	Uses limited range of pronunciation features.	Cannot response without noticeable pauses and speak slowly.	Shows repetition use of simple connectives and breakdowns in coherence.	Produces basic sentences forms.	Uses simple vocabulary to convey personal information.
1/A0	Mispronunciations are frequent and cause some difficulty for the listener.	Pauses lengthy before utterances.	Unable to convey the main message.	Cannot produce the basic sentence structures.	Produces isolated words.

Appendix (3): Oral Vocabulary Test

1: *I work for a ………(company, robe, drum).*

1 b: /ʔa.ni nix.dim fi………('ʃa.ri,ka, 'ħa.bil, dar.'buː.ka)/.

2: *I have golden … ……… (fish, window, pepper).*

2 b: /ʕindi ………….dahbiya ('samaka, 'ru.ʃin, 'filfiil)/.

3: *The baby removed the ………from around his neck. (bib, school, farm).*

3 b: /ʔil-be.be ħaw.wil ʔil-…….. min ru.gib.ta. ('mariga, 'madirsa, 'mazirʕa)/.

4: *He is not single; he is ………. (shop, married, company).*

4 b: /huw.wa miʃ ʕaːzib; huwa ……..(ma'ħal, mid'zawwiʒ, 'ʃarika)/.

5: *His hair is ……… (clinic, messy, hospital).*

5 b: /ʃaʕ.ra ………(mis'tawsˤif, mid'bahdil, mus'taʃfa)/.

6: *For the next three days, the…….. would be closed. (almond biscuit, clinic, soup).*

6 b: /li-tla.ta ʔaj.ja.maːt, ʔil ………ħat-sakir. (ʕa'bamber, mis'tawsˤif,'ʃarba)/.

7: *He is very ……… (angry, money pot, carrot).*

7 b: /huw.wa ……… hal.ba. (mit 'ʕaflig, ʃig'gaːga, sfan'naːri/.

8: In the ……………., I want to be a teacher. (pepper, soup, future).

8 b: /fi ʔil-…………….., nib.bi ʔin.kuːn mu.dar.ris. ('filfil, 'ʃarba, mus'taqbil)/.

9: They have a …………appointment. (hospital, cow, pan).

9 b: /hum.ma ʕind.hum maw.ʕid fi ʔil ……… (mus'taʃfa, 'bugra, 'tˤawa)/.

10: *He has a……… idea. (different, bib, office).*

10 b: /huw.wa ʕin.da fik.ra …………….('mariga, mux'tilfa, 'maktib)/.

11: *His Mum is wearing ……….. (veil, soup, storage).*

11 b: /ʔum.ma ……… (mix'timra, 'ʃarba, 'maxzin)/.

12: *He wanted to be an ……..since he was a child. (engineer, school, glass).*

12 b: /huw.wa yib.bi ji.kuːn …………… min lama sˤɣaj.jir. (mu'handis, 'madirsa, 'muriʃ)/.

13: *……….and ……….are the most popular drink and cookie in wedding ceremony in Libya. (pepper ,almond biscuit, almond syrup, carrot).*

13 b: ………ʔu ……… ʔak.tir ʃa.raːb ʔu ħa.la.wij.jaːt mu.fa.dˤa.la fi 'ʔil-ʔaʕ.raːs fi liːb.ja/. ('filfil, ʕa'bamber, ru'zaːtˤa, sfan'naːri)/.

14: *Ahmed is an Arabic language ………… (teacher, trees, woods).*

14 b; /ʔaħ.mid ……….. lu.ɣa ʕa.ra.bij.ja (mu'darris, ʃi'jar, 'ɣaba)/.

15: *She wants to live on a ………. (lizard, farm, drum).*

15 b: /hij.ja tib.bi tus.kin fi ………(bu.kiʃ 'ʃaːʃ, 'mazirʕa, dar'buːka)/.

16: *Nada goes to a primary ………….. (school, bib, glass).*

16 b: /na.da tim.ʃi li ……… ʔib.ti.da.ʔij.ja ('madirsa, 'mariga, 'muriʃ)/.

17: The ……………helps to clean the house. (hoover, hospital, pan).

17 b: /ʔil ……….. tsaː.ʕid fi tan.dˤiːf ʔil-ħuːʃ ('makinsa, mus'taʃfa, 'tˤawa)/.

18: *I borrowed a book from the ……… (farm, glass, library).*

18 b: /ʔa.ni ʔis.ta.ʕart ʔik.taːb min 'ʔil………… ('mazirʕa, 'muriʃ, 'makitba)/.

19: *………… was broad (his smile, his carrot, his pepper).*

19 b: /………waːs.ʕa. ('basimta, sfan'naːrita, 'filfila)/.

20: *The ……. is a male sheep (ram, robe, window).*

20 b: /ʔil …….. ji.kuːn 'ʔil-xruːf 'ʔil-mu.da.kir. ('kabiʃ, /'ruʃin/ /'ħabil)/.

21: *The most important chess piece is the ……… (king, bib, clinic).*

21 b: /ʔa.ham tˤaruf fi ʔil-ʃatˤ.ranʒ ʔil ………..('malik, 'mariga, mis'tawsˤif)/.

22: *April comes ……….May. (before, after).*

22 b: /ʔab.riːl ji.ʒeː ………….maːju. ('gabil, 'baʕid)/.

23: *The ……….was hardly walking. (old man, school, hole).*

23 b: /ʔil …… du.ba gaː.der jim.ʃi. (ʃi'baːni, 'madirsa, 'ħufra)/.

24: *I live in a ………….of 9 floors (building, married, cow).*

24 b: /ʔa.ni nus.kin fi ………..min tis.ʕa ʔad.waːr. (ʕi'maːra, mid'zawwiʒ, 'bugra)/.

25: *………….is a vegetable and orange in the colour. (carrot, robe, hole).*

25 b: /………..min ʔil-xudˤ.ra ʔu luː.na bur.tu.qaː.li (sfan'naːri, 'ħufra, 'ħabil)/.

26: *Ahmed plays…….. well. (teacher, school, drum).*

26 b: ʔaħ.mid ji.dar.bik kwaj.jis bi ʔil- …………..(mu'darris, 'madirsa, dar'buːka)/.

27: *The girl saved her money in a ………..for a year. (money pot, old man, carrot).*

27 b: /ʔil-bint das.sit fluːs.ha fi ʔil- …………….li sa.na.(ʃig'gaːga, ʃi'baːni, sfan'naːri).

28: *I have a pain in my …………. (office, hoover, throat).*

28 b: /ʕindi ʔa.lam fi ʔil-……….('maktib, 'makinsa, gar'ʒuːma)/.

29: *The colour of the…………is black (sky, beetle).*

29 b: /ʔil …………luːnha ʔaswid (xanfuːsa, smeː)/.

30: *…………..lives in hot countries such as Libya. (lizard, company, farm).*

30 b: /…………… ji.ʕiːʃ fi ʔil-du.wal ʔil-saːx.na. (bukiʃ 'ʃaːʃ, 'ʃarika, 'mazirʕa)/.

31: *…………..is North African type of fruit. (clementine, soup, hole).*

31 b: /……………faːk.ha min ʃa.maːl afriːq.ja. ('ʃarba, 'ħufra, manda'liːn)/.

32: *They are ………….because they passed their exam. (farm, company happy).*

32 b: /hum.ma ……….li-ʔan.na niʒ.ħu fi ʔim.ti.ħan.hum. ('mazirʕa, 'ʃarika, firħa'niːn)/.

33: *I bought ………from the shop. (Wine glasses, king, throat).*

33 b: /ʔa.ni ʃreːt ……min ʔil-ma.'ħal (ki'saːn, 'malik, gar'ʒuːma)/.

34: *The colour of ……..is yellow (chicks, sky).*

34 b: /luːn ʔil…………ʔasfur (flail:s, sme:)/.

35: The ...………protects the building. (security guard, engineer, teacher)

35 b: / ʔil………… jaħ.mi ʔil-ʕi'maːra. (ɣ̥a'fiːr, mu'handis, mu'darris)/.

36: *A piece of ………..hurts her hand. (school, king, glass).*

36 b: tˤa. ruf …………….ʒraħ ʔid.ha. ('madirsa, 'malik, 'muriʃ)/.

37: *Open the……………, please! (floor, sand, window).*

37 b: /'ʔaf.tiħ ʔil-…………., min 'fadˤ.lik! (lu'tˤa, 'gaz.za, 'ruʃin)/.

38: *I need a long…………. (school, sand, rope).*

38 b: /ʔa.ni miħ.taː.ʒa ……….. tˤwiːl ('madirsa, 'gaz.za, 'ħabil)/.

39: *This ………..opens early. (shop, carrot, rope).*

39 b: /ʔil-……………ha.da jaftiħ bak.ri (ma'ħal, sfan'na:ri, 'ħabil)/.

40: *This garden is full of …………. (trees, shop, company).*

40 b: ʔil-ʒer.diː.na ha.di ʔim.ʕab.ja bi ʔil-…………(ʃi'jar, ma'ħal, 'ʃarika).

41: *………....and ………....are full of pictures (living room, corridor, rope).*

41 b: /………ʔu ………ʔim.ʕab.ja bi ʔil-sˤu.war. ('sˤala, ma'mar, 'ħabil)/.

42: *I saw flowers in the……….. (throat, almond biscuit, woods).*

42 b: /ʔa.ni ʃu.fit wa.rid fi ʔil- ……….(gar.'ʒu:.ma, ʕa.'bam.ber, 'ɣaba)/.

43: *I tripped over the cat and I fell …………. (downstairs, engineer, company).*

43 b: tʕa.tirt bi ʔil-gatˤ.tˤu:.sa ʔu tˤuħit …………. ('lutˤa, mu'handis, 'ʃarika)/.

44: *This is a frying ………… (throat, pan, cow).*

44 b: /ha.di ………li ʔil-ga.li (gar'ʒu:ma, 'tˤawa, 'bugra)/.

45: *I prefer salad with sweet …… ... (pepper, sand, hole).*

45 b: /ʔa.ni ʔin.fadˤ.dˤul sla:tˤ bi ʔil-……… ʔil-ħi.lu ('filfil, 'gaz.za, 'ħufra)/.

46: *I work in a small …………. (office, window, robe).*

46 b: /ʔa.ni nix.dim fi ……… sˤɣajjir ('maktib, 'ruʃin, 'ħabil)/.

47: *Old clothes are in the ……….. room. (old man, almond syrup, storage).*

47 b: /ʔil-'ħwa:jiʒ lig.di:ma fi ʔil-………. (ru'za:tˤa, ʃi'ba:ni, 'maxzin)/.

48: *I bought …………for my table. (table cover, window, clinic).*

48 b: /ʔa.ni ʃre:t……….li tˤa:.wil.ti ('mafriʃ, 'ruʃin, mis'tawsˤif)/.

49: *The fisherman threw the ………. (net, office, cow).*

49 b: /ʔil sˤaj.ja:d law.waħ ʔil-………('ʃibka, 'maktib, 'bugra)/.

50: *I like the Libyan red ……….(soup, throat, downstairs).*

50 b: /ʔa.ni ʔin.ħib ʔil- ………ʔil-li:.bij.ja ʔil-ħam.ra ('ʃarba, gar'ʒu:ma, lu'tˤa)/.

51: *He dug out a small (hole, cow office).*

51 b: /huw.wa ʔiħ.far …………sˤɣi:.ra. ('ħufra,'bugra,'maktib)/.

52: *I have a ……… in the farm. (throat, cow, downstairs).*

52 b: /ʔa.ni ʕin.di ……….fi ʔil-mazirʕa. ('bugra, gar'ʒu:ma, lu'tˤa)/.

53: *I ………. the chair. (overturn, write).*

53 b: / (ʔa.ni) ………ʔil-kursi ('niglib, 'niktab)/.

54: *The chair was ……(overturned, written).*

54 b: /ʔil-kursi ………..(nig'lab, nik'tab)/.

55: *I …………to a baby (give birth, eat).*

55 b: /(ʔa.ni) …………fi ʔil-bebe. ('nuwlid, 'niktib)/.

56: *The baby was ……… of her (born, written).*

56 b: /ʔil-bebe………min.ha (nuw'lad, nik'tab).

57: *I ………… a letter. (write, draw).*

57 b: /(ʔa.ni) ……….. fi risaːla ('niktib, 'nirsim)/.

58: *The book was ……… (written, drawn).*

58 b: /ʔil-ktaːb ………(nik'tab, nir'sam)/.

59: *I ……………a house on a paper (draw, write).*

59 b: /(ʔani) …………..fi ħuːʃ ('nirsim, 'niktib)/.

60: *The house was ……… (drawn, written).*

60 b: /ʔil-ħuːʃ ……… (nir'sam, nik'tab)/.

61: *He ………the route of the train. (changed, ate).*

61 b: /huw.wa ……..tˤriːg il qitˤaːr ('baddel, 'kleː)/.

62: *I …………. the route of the train. (changed, ate).*

62 b: /(ʔani)………tˤriːg ʔil-qi.tˤaːr (bad'delt, 'kleːt)/.

63: *He …………of new idea. (thought, cooked).*

63 b: /huw.wa …………fi fik.ra ʒdiː.da. ('fakkir, 'tˤajjib)/.

64: *I ………….. of new idea.(thought, cooked).*

64 b: /(ʔa.ni)…………fi fik.ra ʒdiː.da (fak'kirt, tˤaj'jibt)/.

65: *He …………the cup. (broke, ate).*

65 b: /huw.wa ……… ʔil-fin.ʒaːn. (kas'sir, 'kleː)/.

66: *I ………… the cup. (broke, ate).*

66 b: /(ʔa.ni) ……… ʔil-fin.ʒaːn (kas'sirt, 'kleːt)/.

67: *……….your clothes. (wear, read).*

67 b: ……… ħwaːj.ʒik ('ʔalbis, 'ʔagra).

68: *He ………his clothes. (wore, read).*

68 b: /huw.wa………..ħwaːj.ʒa (ʔil'bas, 'greː)/.

69: …………! I do not care about you! (get angry, (command) , clam down).

69 b: /………… miʃ-ʔim.ʕad.la ʕleːk ('ʔazʕil, 'ʔahda)/.

70: *He ……………. because of the problem. (got angry, calmed down).*

70 b: huw.wa …………bi sa.bab ʔil-muʃkla. (ʔiz'ʕal, 'ʔihdi)/.

71: *………… the door, please! (open, break).*

71 b: ……… ʔil-baːb min fadˤlik! ('ʔaftiħ, 'kassir)/.

72: *He ………… the door (opened, broke).*

72 b: /huw.wa…………ʔil-baːb (ʔif''taħ, ʔik'sar)/.

73: *………the floor ! (mop, drink).*

73 b: /………..ʔil- luta. ('ʔamsaħ, 'ʔuʃrub)/.

74: *He …………. the floor. (mopped, drunk).*

74 b: /huw.wa …............... ʔil luta (ʔim'saħ, ʔiʃ 'rab)/.

Appendix (4): Tasks

The English speaking learners receive instruction in English to avoid any misunderstanding and the native speakers receive instruction in Arabic.

Production: Picture naming Task

- In this task, you will see one picture in each slide. Each picture contains a translation in English and sometimes arrows or circles to help you to elicit the target item. You will be required to name the noun or the action of the verb in its inflected form (i.e. some alternation to the verb).
- You will have some practice items before the real test to familiarise you with the task and to help you understand the tense of the verb (i.e. the time reference of the verb: past, present or command) or the person (i.e. if the verb refers to *I, you, he/she or unknown*). The researcher will explain and assist you with the practice items.
- You can take as much time to decide on the way you want to pronounce the target word.
- You can stop and ask any questions at any time. I can assist you with the alternation of the verb and guide you if you pronounce a synonymous item but I cannot pronounce the target item.
- You will be asked to look at the picture and when you are ready say the word out loud three times at normal speech rate. When you finish, press the key 'Enter' to move to the next slide.
- You can stop and ask for a break and refreshments at any time.
- At the end of the task, a slide with ''the end of production task'' will appear.

Perception: Identification Task

- In this task, you will listen to the same words used in the production task. The words are pronounced three times: the first one will be produced slowly with intervals between syllables; the second and third time will be produced spontaneously at a normal speech rate.
- You are required to choose the most prominent part of the word (loudest syllable with emphasis i.e. with main stress).
- You will be given a sheet of paper with numbered lines. On each line, there are boxes equivalent to the number of the syllables in the word produced.
- You will mark the box matching the syllable that you think is the most prominent and the loudest with emphasis on the piece of paper.
- You will listen to the native speaker through headphones. You can decide when to move to the next item by clicking on the ‘’Enter’’ key.
- The words will be pronounced in the same order as the boxes appear on the sheet.
- You will have practice items to help become familiarised with the task.
- You can stop and ask for a break and refreshments at any time.
- At the end of the task, a slide with ‘’the end of perception task’’ will appear.

Appendix (5): Identification Task Sheet

Participant Number:…………………………Group:…………………………………..

Mark the box matching the syllable you think is the most prominent and the loudest with emphasis.

1. ☐ ☐ ☐
2. ☐ ☐ ☐
3. ☐ ☐ ☐
4. ☐ ☐ ☐
5. ☐ ☐ ☐
6. ☐ ☐ ☐
7. ☐ ☐ ☐
8. ☐ ☐ ☐
9. ☐ ☐ ☐
10. ☐ ☐ ☐
11. ☐ ☐ ☐
12. ☐ ☐ ☐
13. ☐ ☐ ☐
14. ☐ ☐ ☐
15. ☐ ☐ ☐
16. ☐ ☐ ☐
17. ☐ ☐ ☐
18. ☐ ☐ ☐
19. ☐ ☐ ☐
20. ☐ ☐ ☐

21. ☐ ☐ ☐

22. ☐ ☐ ☐

23. ☐ ☐ ☐

24. ☐ ☐ ☐

25. ☐ ☐ ☐

26. ☐ ☐ ☐

27. ☐ ☐ ☐

28. ☐ ☐ ☐

29. ☐ ☐ ☐

30. ☐ ☐ ☐

31. ☐ ☐ ☐

32. ☐ ☐ ☐

33. ☐ ☐ ☐

34. ☐ ☐

35. ☐ ☐

36. ☐ ☐

37. ☐ ☐

38. ☐ ☐

39. ☐ ☐

40. ☐ ☐

41. ☐ ☐

42. ☐ ☐

43. ☐ ☐

44. ☐ ☐

45. ☐ ☐

46. ☐ ☐

47. ☐ ☐

48. ☐ ☐

49. ☐ ☐

50. ☐ ☐

51. ☐ ☐

52. ☐ ☐

53. ☐ ☐

54. ☐ ☐

55. ☐ ☐

56. ☐ ☐

57. ☐ ☐

58. ☐ ☐

59. ☐ ☐

60. ☐ ☐

61. ☐ ☐

62. ☐ ☐

63. ☐ ☐

64. ☐ ☐

65. ☐ ☐

66. ☐ ☐

67. ☐ ☐

68. ☐ ☐

69. ☐ ☐

70. ☐ ☐

71. ☐ ☐

72. ☐ ☐

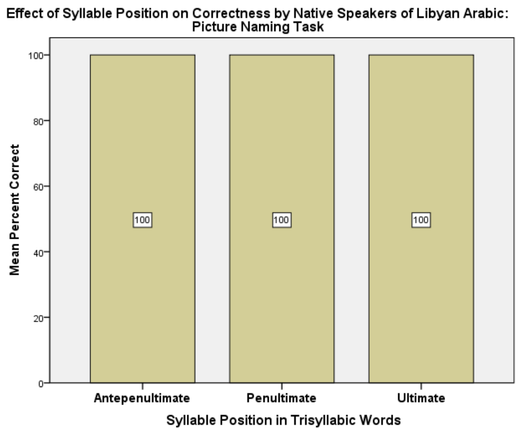
73. ☐ ☐

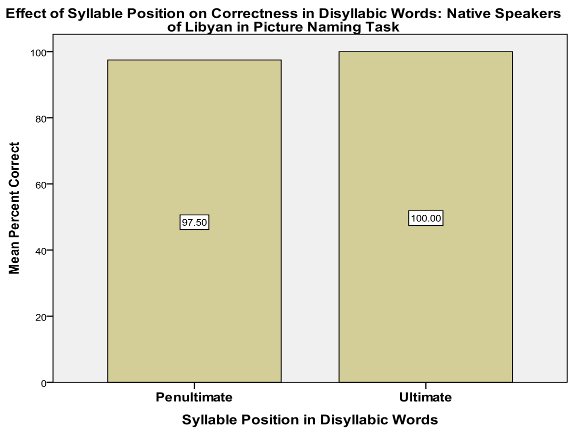
74. ☐ ☐

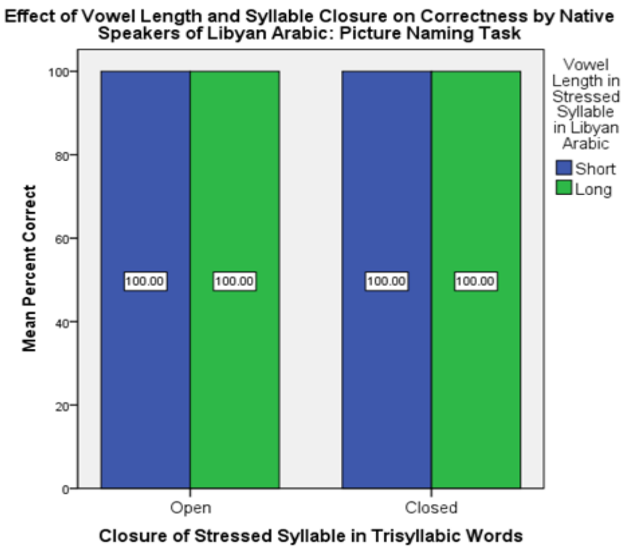
75. ☐ ☐

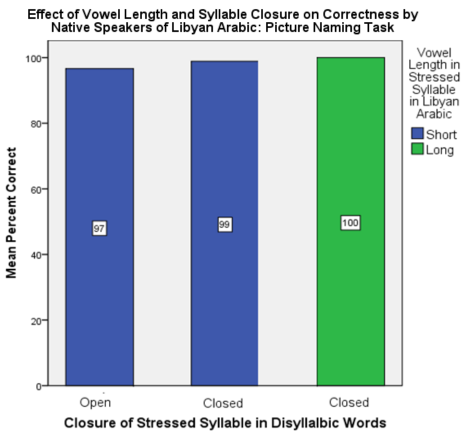
76. ☐ ☐

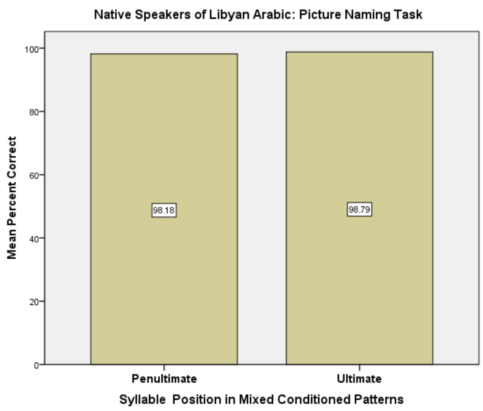
Appendix (6): Native Speakers Graphs for Production











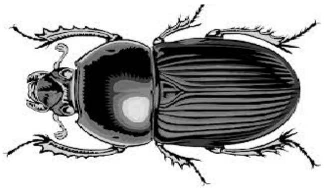
Appendix (7): Pictures


Hospital


Different


wearing veil


Carrot


Beetle


Engineer


Fish

Hoover


Teacher

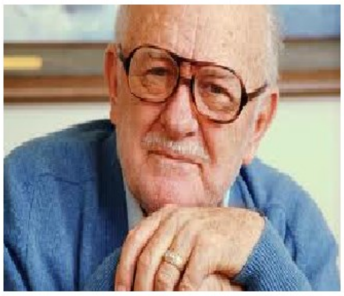

Their King


His smile


Your Ram

Almond Syrup

Building



Old Man

Chicks

Happy

Clementine

Money Pot

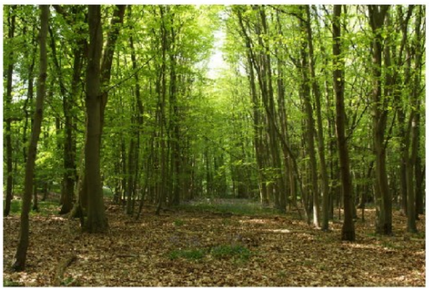
Throat

Glass

Shop

Wine Glasses

Rope



Woods

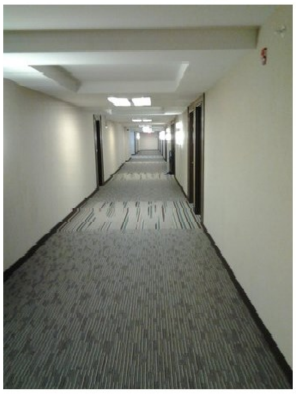
trees

Pan

Living Room

Downstairs

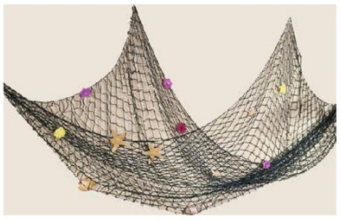
Table Cover



Corridor

Pepper

office



Net

Cow

Soup

Hole

bib

Storage Room


(I) overturn

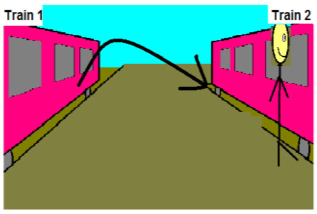

was overturned (by)


(I) give birth

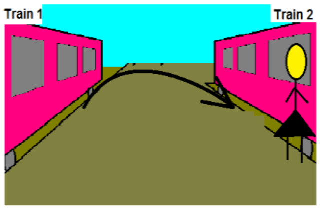

was born


(I) draw

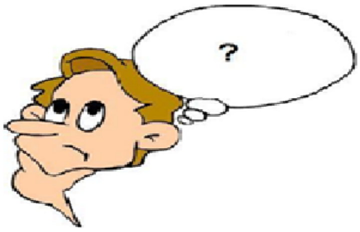

was drawn (by)



(He) Changed



(I) changed


He thought


(I) thought


Be angry (order)


Got angry (past)



Open (order)


He opened (past)


(He) broke


(I) broke


Future

Clinic

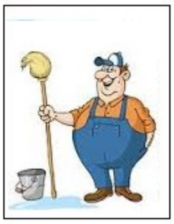
Messy

Securtiy guard

Company

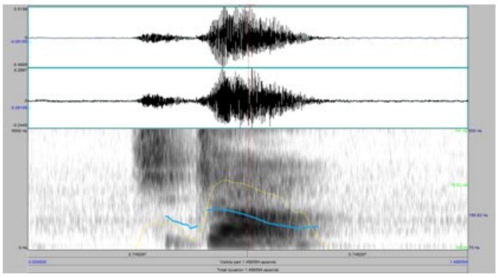
Before them

mop (order)

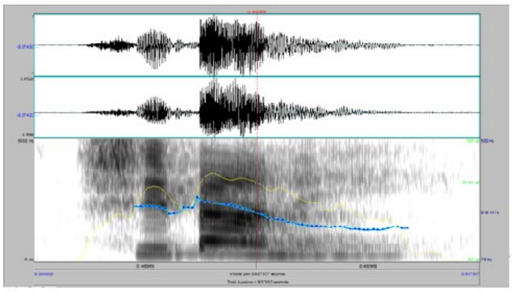


(He) mopped ..(past)

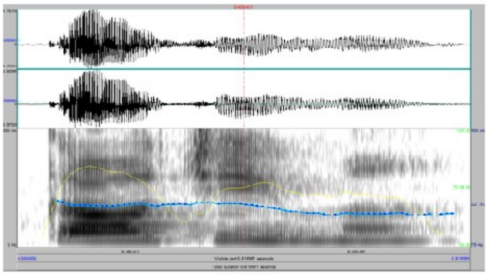
Appendix (8): Praat Images



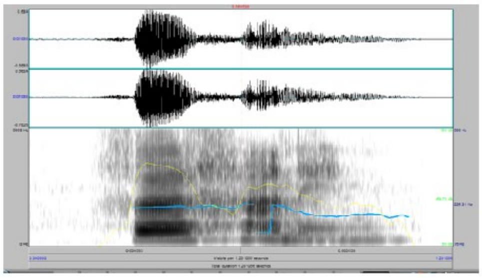
/ʃi'jar/>>[ʃi'ja:] trees,



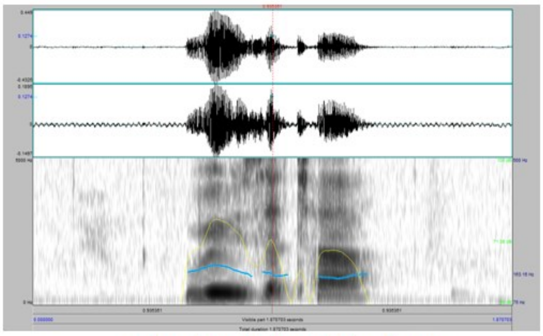
/ʃi'ba:ni/ old man



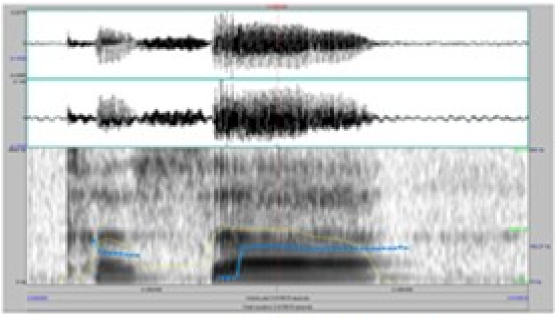
/gar'ʒu:ma/ >>> ['garʒuma] throat,



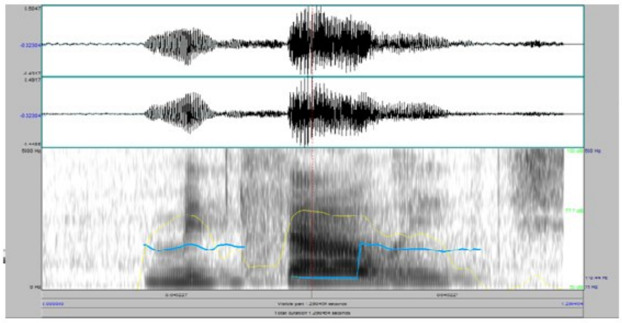
/firħa'ni:n/ >>>[f 'irħanin] happy pl



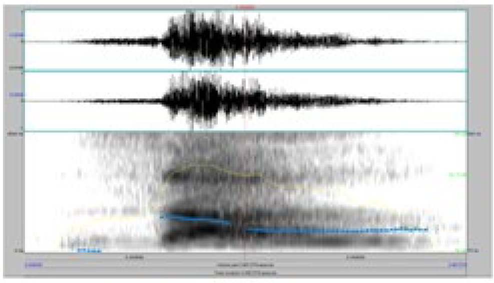
/ru'za:tˤa/ >>[r 'uzata] almond syrup,



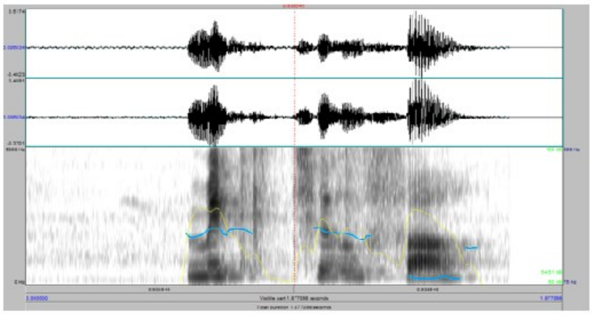
/'kassir,/>> [kas'sir] He broke



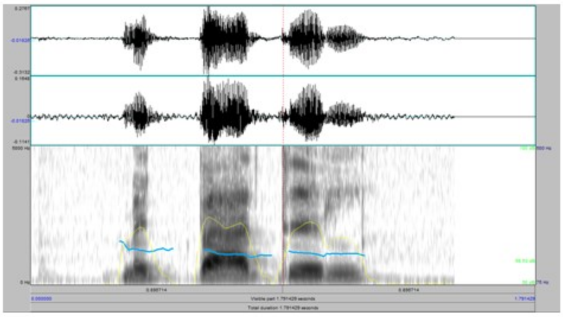
/mid'zawwiʒ/ married,



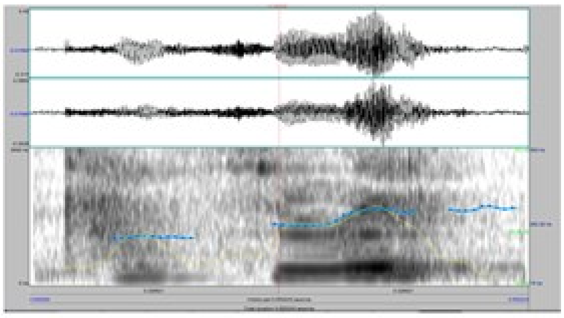
/(ʔ)iz'ʕal/>> [iz'a:l] Got angry (past)



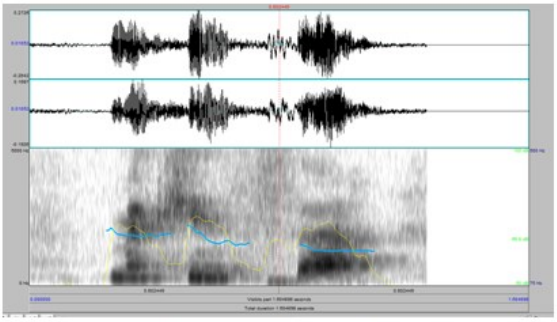
/mux'tilfa/ different,



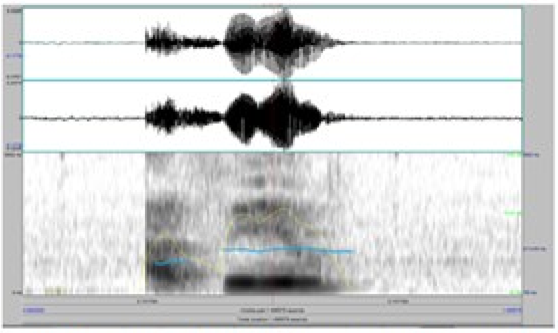
/mid'bahdil/ messy,



/ kas'sirt/ (I) broke



/'makinsa/>>[ma'kinsa] hoover



/'(ʔ)azʕil,/ >> [(ʔ)a'zil] Be angry (imperative)