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A Markedness Approach to Epenthesis in Arabic Speakers' L2 English

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A MARKEDNESS APPROACH TO EPENTHESIS

IN ARABIC SPEAKERS' L2 ENGLISH

By

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This thesis explores how Cairene Arabic, Iraqi Arabic, and Najdi Arabic speakers deal with complex syllable margins in their L2 English. While previous studies have attributed Cairene and Iraqi speakers' pronunciations of English syllables that contain consonant clusters to transfer of allowed syllable structures from their native language, this thesis illustrates that the universal markedness of consonant clusters could be a factor that motivates L2 speakers to simplify complex syllable margins. Universal markedness has to do with the frequency that a structure occurs cross-linguistically. Languages that allow complex syllable margins, such as English, also contain simple syllable margins. Many languages contain simple syllable margins but do not allow complex syllable margins; thus, complex syllable margins are more marked than simple syllable margins. A markedness approach to second language phonology would consider the markedness of complex syllable margins to be an important factor in whether L2 learners have difficulty with this structure. By using Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993), this thesis illustrates the role that markedness plays in Cairene Arabic, Iraqi Arabic, and Najdi Arabic. This thesis also presents the results of a study of L2 English data produced by native speakers of Najdi Arabic and uses the data to support a markedness approach for accounting for syllable errors in L2 English.

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CHAPTER 1: INTRODUCTION

1.0 <u>Introduction</u>

This thesis discusses epenthesis in Arabic speakers' pronunciation of English words containing consonant clusters. Previous studies (Broselow 1983, 1984, 1988, Galal 2004, Aquil 2006) on Cairene and Iraqi Arabic have illustrated how syllabification and pronunciation of English words containing consonant clusters seems to be highly influenced by Cairene and Iraqi Arabic speakers' native language. According to this analysis, Cairene and Iraqi speakers transfer rules regarding syllable structure from their native language to their target language English. This assumption that Cairene and Iraqi speakers' strategies to avoid consonant clusters in their L2 English by transferring strategies from their native language supports the Contrastive Analysis Hypothesis (CAH) (Lado 1957), which predicts that L2 learners have greater difficulty acquiring forms that do not exist in their target language, and this difficulty often results in negative transfer from the native language to the target language. However, another explanation for Arabic speakers' use of epenthesis in their L2 English can be provided using the Markedness Differential Hypothesis (MDH) (Eckman 1977). This chapter will introduce both of these Second Language Acquisition theories.

In the following section, key concepts in Interlanguage Phonology are introduced, followed by an introduction to CAH and MDH. Section 1.3 discusses relevant previous studies that focused on syllables in L2 English. Section 1.4 presents an overview of the data that will be examined in the following chapters, while Section 1.5 introduces Itô's (1986, 1989) analysis of Cairene and Iraqi Arabic using templatic syllabification. Section 1.6 introduces Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993),

which will be used in this thesis to account for L2 English data produced by speakers of Cairene, Iraqi, and Najdi Arabic. Section 1.7 explains the purpose and implications of this thesis, and Section 1.8 provides an outline for this thesis.

1.1 Interlanguage Phonology

While the concept of non-native speakers speaking with a "foreign accent" is not new, the study of interlanguage phonology, or the phonological systems of non-native speakers of a language, has been overlooked in the field of linguistics until recently. Interlanguage phonology began to receive more attention beginning in the 1970s with studies such as Tarone's (1978) paper "The Phonology of Interlanguage," and Eckman's (1977) paper "Markedness and the Contrastive Analysis Hypothesis," where Eckman argued that aspects of interlanguage phonology may be due to markedness of the structures rather than transfer from the L1. Interlanguage phonology continues to be an important research topic today, which can be seen in Galal's (2004) research on L2 English of Cairene speakers. One key question addressed in many studies of interlanguage phonology pertains to whether L2 learners' pronunciation "errors" in their target language is due to negative transfer, where strategies and features from speakers' L1 are transferred erroneously into their L2. Another possible explanation for L2 speakers' pronunciation errors are factors such as markedness or similarities with very subtle differences between the L1 and L2. Indeed, the role of transfer from a learner's native language to the target language has been, and continues to be, one of the most important questions in the study of Second Language Acquisition (SLA).

1.1.1 The Contrastive Analysis Hypothesis (CAH)

CAH (Lado 1957) assumes that learners have access to the target language through the native language; because of this reliance on the native language, L2 learners have the

most difficulty acquiring forms that are not present in their native language (L1). While

CAH in phonology initially focused on segments in phonology, Broselow (1984) applied

CAH to syllables by proposing the Syllable Structure Transfer Hypothesis, which is defined

in (1) below.

(1) Syllable Structure Transfer Hypothesis (Broselow 1984)
When the target language permits syllable structures that are not permitted in the
native language, learners will make errors which involve altering these structures
to those which would be permitted in the native language.

Thus, if consonant clusters are not allowed in a speaker's native language output, the Syllable

Structure Transfer Hypothesis would predict that this speaker will have difficulty with

pronouncing consonant clusters in the target language. This difficulty causes the learner to

transfer the strategy for dealing with consonant clusters in the input from the native language

to the target language, which results in the speaker not having consonant clusters in the target

language output.

While CAH is no longer used to predict when L2 learners will have difficulty with a

structure, a "weaker" version of CAH has still been used to explain L2 errors, such as

Broselow's (1983, 1984, 1988) explanation for Cairene and Iraqi speakers' use of epenthesis

in their L2 English. This version of CAH is considered to be "weaker" than the original

version because the original, or "stronger" version of CAH actually used differences between

the L1 and L2 to *predict* difficulty that L2 learners would experience with a form. The

weaker version does not claim to be able to predict when learners will have difficulty with a

form; rather, the weaker version uses differences between the L1 and L2 to account for

difficulties that L2 learners have already demonstrated experiencing. This weaker version of

the Contrastive Analysis Hypothesis seems to have stood the test of time, as research based

on this hypothesis is still widely conducted.

1.1.2 The Markedness Differential Hypothesis (MDH)

Twenty years after the Contrastive Analysis Hypothesis was introduced, the

Markedness Differential Hypothesis (Eckman 1977) was designed to explain errors in second

language acquisition. Like the Contrastive Analysis Hypothesis, the Markedness Differential

Hypothesis considers native language transfer; however, the Markedness Differential

Hypothesis also takes into account the degree of markedness of a form in the target language

before predicting the relative difficulty a learner will have in producing the target form. The

concept of markedness is universal rather than language-specific. Marked forms are cross-

linguistically rarer than their unmarked counterpart or other unmarked forms. Moreover, if a

language contains the marked form, it must also contain the unmarked form, which is

explained with "if p then q:" if a language has the marked structure represented by p, it will

also have the unmarked structure, represented by q. For instance, complex onsets and codas

are more marked than simple onsets and codas (Blevins 1995); thus, if a language contains

complex onsets and/or codas, it will also contain simple onsets and codas.

According to the Markedness Differential Hypothesis, because complex syllable margins

(this includes complex onsets and complex codas) are more marked than simple syllable

margins, L2 learners whose L1 does not allow complex syllable margins may have difficulty

acquiring L2 forms containing complex syllable margins. A learner whose L1 contains

complex syllable margins is not expected to have difficulty acquiring forms in an L2 where

only simple syllable margins are allowed because the learner is moving from a more marked

form in the native language to a less marked form in the target language. Thus, forms in the

target language that are different or nonexistent in the native language will be easier to learn

if they are unmarked.

A "stronger" version of MDH, which is discussed by Tarone (1980) would predict that the markedness of the structure could have a stronger influence over the difficulty than the L1. Thus, this stronger version of MDH would predict that even speakers of L1s that allow complex syllable margins will have difficulty with complex syllable margins in their L2 because the form is marked. This possibility is not acknowledged by CAH because, according to CAH, learners should not have difficulty acquiring structures in their L2 that also exist in their L1.

Both the MDH and CAH have been applied to some of the data that will be analyzed in this study, namely English produced by native speakers of either Cairene Arabic or Iraqi Arabic. This thesis focuses solely on the speakers' pronunciation of English words containing consonant clusters, which are considered to be universally marked (Blevins 1995). If consonant clusters are not allowed in the speakers' native Arabic dialect, CAH would predict that these speakers will have difficulty acquiring the structure. However, MDH would also predict that speakers whose L1 lacks consonant clusters will find acquiring this structure in English to be especially difficult because complex syllable margins are more marked than the simple syllable margins. In order to better determine whether epenthesis in Arabic speakers' L2 English is due to transfer, as CAH would predict, or markedness, as MDH would predict, L2 English learners who speak languages that also allow complex syllable margins should be examined.

1.2 Previous Studies

The issue of interlanguage syllabification has captured the interest of many linguists, and work has been done to analyze interlanguage syllables from a variety of native and target languages. Broselow (1983) asserts that syllable-related issues are more susceptible to

transfer than morphological issues, which is reflected in her Syllable Structure Transfer Hypothesis (Broselow 1984). She uses epenthesis in Cairene and Iraqi Arabic speakers' L2 English as evidence of speakers transferring allowed syllable structures from their L1 to their L2. The issue of pronouncing consonant clusters in a target language when such forms may not be permitted in the native language has been explored not only in Arabic speakers' pronunciation of English; other studies exploring how English consonant clusters are pronounced by non-native speakers have been conducted by numerous linguists. Karimi (1987), for example, examined how native speakers of Farsi pronounce English words containing word-initial consonant clusters and compared it to Cairene Arabic speakers' pronunciation. Karimi found that, like Cairene speakers, Farsi speakers use epenthesis to break up word-initial clusters. In Karimi's study, CAH was used to explain epenthesis in Farsi L2 English. However, as Karimi points out, the use of epenthesis to break up English consonant clusters could not be transferred from Farsi because Farsi uses deletion, not epenthesis, to break up consonant clusters in the input.

Tarone (1980) compared how native speakers of Korean, Cantonese, and Portuguese dealt with consonant clusters in L2 English and determined that strategies to simplify complex syllables in the L2 cannot be solely due to transfer because speakers of L1s that have the same complex syllables still make syllable errors in their L2. She examined speakers of Cantonese and Portuguese because both of these languages have mostly CV syllables, although they do allow a simple coda with certain consonants; Korean, on the other hand, allows more complex syllable margins, making it more like English than Cantonese and Portuguese when it comes to syllable structure. Tarone included native speakers of Korean in her study because, if simplifying complex syllable margins in L2 English was due

to transfer, the Koreans shouldn't produce as many syllable errors in which epenthesis or deletion is used to simplify complex syllables. Her findings were that the native speakers of Korean had a similar percentage of syllable structure errors as the Cantonese and Portuguese speakers: the average percent of error for the Korean speakers was 21%, while the averages for the Cantonese and Portuguese speakers were 21.5% and 18.5%, respectively. The syllable errors reported use both epenthesis and deletion; of the three groups, only the Portuguese speakers favor epenthesis as the strategy for simplifying syllables.

Tarone's (1980) results can be interpreted as indicating that L2 English speakers' errors in syllable structure are not merely due to transfer and cannot be sufficiently accounted for by CAH alone. The fact that speakers of languages (in this case, Korean) that allow similar complex syllable margins also make syllable structure errors at a rate similar to speakers of languages (Cantonese and Portuguese), which do *not* allow complex syllable margins, can be interpreted as supporting what Tarone refers to as a "strong" version of MDH. Eckman's (1977) version of MDH would predict that speakers of L2 English will have difficulty acquiring its complex syllable structures if the speakers' L1 does not contain these structures because complex syllable margins are universally marked. The results from Tarone's (1980) study can be interpreted as supporting a stronger version of MDH where markedness takes precedence over the L1 because speakers whose L1 allowed codas and complex syllable margins had a similar rate of error to speakers whose L1 did not allow these structures.

Tarone (1980) interprets the use of both epenthesis and deletion to simplify complex syllables as evidence against Oller's (1974) paper where he argued that L2 learners do not use the same strategies for simplifying complex syllables as L1 learners. L1 learners under the age of three years tend to use deletion to simplify syllables, while the L2 data Oller

discussed always used epenthesis to simplify syllables. Thus, the fact that learners do use

deletion may support the argument that L2 acquisition uses L1 acquisition processes;

however, since Tarone's subjects often used epenthesis, it seems that their strategies for

simplifying complex syllables cannot be attributed solely to L1 acquisition processes.

While the pervasiveness of syllable-related transfer has been discussed using a plethora

of languages, data from Cairene Arabic and Iraqi Arabic have provided, and continue to

provide, a basis for describing and analyzing syllabification, both in the speakers' L1 and in

their L2 English. However, it should be noted that both Cairene and Iraqi Arabic are similar

to Portuguese and Cantonese in that the complex syllable structures found in English are not

found in these dialects. Thus, if the speakers have difficulty producing English forms with

complex syllable margins. it will be difficult to determine if their syllable structure errors are

due to transfer or some other factor, such as markedness.

<center>1.3 The Data</center>

This study will examine the pronunciation of English words containing consonant

clusters spoken by Arabic speakers of various dialects. Chapters 2 and 3 will first cover data

from Cairene Arabic speakers and Iraqi Arabic speakers, which was described and analyzed

based on syllabification first by Broselow (1980). Selkirk (1980) reanalyzed the data

Broselow presented, and Broselow (1984) continued her study of the data in published

papers. In 1986, Junko Itô added to the research done on this data in her doctoral thesis

Syllable Theory in Prosodic Phonology, which was published in book form in 1988. Itô's

theory of Templatic Syllabification is described in Section 1.3 of this chapter and discussed

in greater detail in Chapter 2.

1.3.1 English Pronounced by Cairene Arabic and Iraqi Arabic Speakers

Speakers of Egyptian and Iraqi Arabic who speak English as a second or foreign language display the phenomena of epenthesis: they insert the vowel [i] to break up consonant clusters when speaking English. The table in (2) below illustrates the pronunciation of English words that contain consonant clusters by both Cairene Arabic speakers and Iraqi Arabic speakers. Syllable boundaries are indicated with a period.

(2) Cairene Arabic and Iraqi Arabic pronunciation of English words (Broselow 1980)

English word	Cairene Arabic pronunciation	Iraqi Arabic pronunciation
floor	[fi.lo:r]	[ʔif.lo:r]
plastic	[bi.las.tik]	not reported
three	[θi.ri:]	[ʔiθ.ri:]
translate	[ti.ran.si.let]	not reported
Fred	[fi.rɛd]	[ʔif.rɛd]
plane	not reported	[ʔib.le:n]
children	[tʃil.di.ren]	[tʃi.lid.ren]

As Table (2) illustrates, while both Cairene Arabic and Iraqi Arabic speakers epenthesize [i] to break up consonant clusters in English words, the placement of [i] and the syllabification of the form differs depending on which Arabic dialect the speaker of L2 English speaks. For instance, the English word 'floor,' which contains a word-initial 2-consonant cluster, is pronounced [ʔiflo:r] by Iraqi Arabic speakers and [filo:r] by native speakers of Egyptian Arabic. Thus, the Iraqi Arabic speakers insert the [i] *before* the first consonant in the

consonant cluster, while the Egyptian Arabic speakers insert the [i] *after* the first consonant in the consonant cluster. The epenthetic [i] causes the form to be resyllabified; thus, the monosyllabic 'floor,' after the epenthetic [i] is inserted by a Cairene speaker, becomes the disyllabic [fi.lo:r] where there are no complex onsets because [i] splits up the [f] and [l] so that each becomes the onset of a separate syllable.

While multiple analyses have been proposed to explain why the [i] is placed in a different position in these two Arabic dialects, the analysis this thesis focuses on is Itô's concept of templatic syllabification, which is discussed thoroughly in Chapter 2.

1.3.2 English Produced by Najdi Arabic Speakers

While the Cairene Arabic and Iraqi Arabic speakers' interlanguage syllabification has been examined and analyzed by many linguists, little research has been done to explore how speakers of other dialects of Arabic treat consonant clusters when speaking L2 English. Research done for this thesis elicits data from Najdi Arabic speakers of L2 English in order to determine how these speakers treat consonant clusters in English words. Najdi Arabic was chosen for this study partially because, unlike Cairene and Iraqi Arabic, complex syllable margins abound in this dialect. Because Najdi Arabic allows many complex syllable structures that are similar to the structures found in English, if the Najdi speakers produce syllable structure errors, it would further support the Markedness Differential Hypothesis and the argument that transfer alone is not the reason that L2 speakers of English utilize strategies to break up consonant clusters.

Before exploring L2 English forms produced by Najdi speakers, Chapter 4 presents a description of syllable structures and syllabification in Najdi Arabic as described by Abboud (1979). In Chapter 5 data collected from Najdi speakers of L2 English are put into OT

tableaux to illustrate the interaction of markedness and faithfulness constraints on their L2 English output.

1.4 Templatic Syllabification

Templatic syllabification was used by Itô (1986, 1989) to explain consonant cluster simplification and epenthesis in many languages, including Cairene Arabic and Iraqi Arabic. According to this analysis, a language's grammar provides the structure for the optimal shape of a syllable; this pre-specified syllable structure is called a syllable template. When vowel epenthesis occurs, the vowel should be inserted in a place that is harmonious to the syllable template defined by the language. Itô claimed the syllable template for Arabic, in both the Cairene and Iraqi dialects, is [CVC].

If both Cairene Arabic and Iraqi Arabic have the same syllable template, why is an English word such as 'floor' pronounced differently in Egyptian Arabic than in Iraqi Arabic? Itô's (1986) answer for this is *directionality*: the reason that the vowel epenthesis occurs in a different place depending on the dialect is due to the *direction* that the [CVC] syllable template is mapped onto the word.   Cairene Arabic maps the syllable template onto a word from left to right (L➜R), while Iraqi Arabic maps the syllable template onto a word from right to left (R➜L). The syllable template of Cairene and Iraqi Arabic, how it applies to the Cairene and Iraqi dialects of Arabic, and how it can be applied to Cairene and Iraqi Arabic speakers' pronunciation of English, is discussed in detail in the next chapter.

1.5 Optimality Theory

Optimality Theory was introduced by Prince and Smolensky (1993) and McCarthy and Prince (1993) as an alternative to rule-based theory phonology. Instead of viewing a

language's phonology as a series of rules that acts sequentially on an utterance, Optimality Theory proposed that a form is acted on simultaneously by a hierarchy of constraints that fall into one of two categories: faithfulness constraints and markedness/well-formedness constraints. Faithfulness constraints are concerned with the output being faithful to the input, while markedness constraints are concerned with making the output less marked. Any input has an infinite number of possibilities for the output, but the optimal output is determined by which output candidate has the least violations of the constraints.

Because one of OT's main focuses is markedness constraints, it combines well with the MDH when describing and accounting for L2 data. OT can be used to illustrate how markedness affects the output of a form, and assessing how markedness affects output is the focus of MDH.

1.6 Purpose and Significance of Thesis

The purpose of this thesis is to illustrate how forms in Arabic speakers' L2 English could be explained using the Markedness Differential Hypothesis (MDH) (Eckman 1977) rather than CAH. The Markedness Differential Hypothesis predicts that L2 learners will have more difficulty acquiring more marked forms in their L2; thus, if a relatively unmarked form in the L2 is not part of the speaker's native language, the speaker will not have difficulty acquiring this form because it is relatively natural, or unmarked. Markedness is determined by the frequency of a form appearing cross-linguistically. Some forms, cross-linguistically, seem to be avoided; thus, they are considered to be less natural, marked. To illustrate the role markedness plays in Arabic speakers' pronunciation of English forms containing consonant clusters, I will use Optimality Theory, which combines well with MDH because markedness plays a key role in Optimality Theory. By using Optimality Theory, this thesis will illustrate

that transfer of syllabification and epenthesis strategies from Arabic speakers' L1 to their L2 English is not the only explanation for these speakers' pronunciation errors with English consonant clusters.

In addition to providing an OT analysis of L2 English forms produced by native speakers of Arabic, this thesis also adds to phonological research of Arabic speakers of English by collecting and analyzing data produced by native speakers of Najdi Arabic, which is spoken in central Saudi Arabia. While the Cairene and Iraqi data explored in this thesis come primarily from Itô (1986, 1989) and Broselow (1983, 1984) and analyses abound regarding these two dialects, other Arabic dialects have been less represented in Second Language Phonology Acquisition. Thus, another purpose for this thesis was to gather data from the Najdi Arabic dialect in order to compare Najdi speakers' strategies for dealing with English consonant clusters to those of Cairene and Iraqi speakers.

Because Najdi Arabic is closer to English regarding consonant clusters in that word-initial biconsonantal clusters and word-medial triconsonantal clusters are allowed, data from this dialect can further the investigation of whether the Cairene and Iraqi L2 pronunciations are due to transfer. CAH would predict that Najdi speakers would not use epenthesis to break up word-initial biconsonantal and word-medial triconsonantal clusters in their L2 English because these forms are present in their native language. MDH, on the other hand, would take into account that consonant clusters are universally marked, which suggests that even speakers of languages that have consonant clusters will have difficulty acquiring this form in their L2.

Knowledge of the strategies Arabic speakers use when dealing with consonant clusters in their L2 English has benefits in the pedagogical realm. If ESL instructors are

aware that their students will encounter difficulty with English syllable structure, they can focus on helping their students improve their pronunciation of English consonant clusters. Moreover, since this thesis aims to show how L2 English learners may utilize strategies to break up English consonant clusters due to the universal markedness of complex syllable margins rather than just transfer from their L1, the implications are that speakers of other languages, even languages that allow complex syllable margins, could benefit from instruction on English consonant clusters.

<u>1.7 Outline of Thesis</u>

This chapter gave a brief introduction to key concepts when analyzing L2 English produced by native speakers of Arabic. In Chapter 2 templatic syllabification is discussed, as templatic syllabification is the currently accepted account for epenthesis in Cairene and Iraqi Arabic. The end of Chapter 2 applies directional templatic syllabification to Cairene and Iraqi speakers' L2 English to illustrate how these speakers strategies for dealing with English consonant clusters can be attributed to transfer from their native language. Chapter 3 provides an Optimality Theory (OT) analysis of L2 English produced by speakers of Cairene and Iraqi Arabic that supports an account based more on markedness than transfer. Chapter 4 introduces the Najdi Arabic dialect as it has been described previously by Abboud (1979) before Chapter 5 describes the data collected from Najdi speakers of L2 English and uses OT to account for forms containing word-initial biconsonantal clusters and word-medial triconsonantal clusters. Chapter 6 concludes this thesis.

CHAPTER 2: TEMPLATIC SYLLABIFICATION

2.0 Introduction

In this chapter, I will explain how Junko Itô (1986, 1989) analyzed epenthesis in Cairene Arabic and Iraqi Arabic using templatic syllabification. Templatic syllabification relies on two concepts: syllable templates and directionality. Itô (1986, 1989) presented an analysis of Cairene and Iraqi Arabic where she accounted for epenthesis and the different sites of epenthesis with templatic syllabification. As Broselow (1983, 1984) points out, Cairene and Iraqi speakers of L2 English seem to use epenthesis in much the same way as when they speak their native language. Thus, Broselow concludes that epenthesis in Cairene and Iraqi speakers' L2 English is due to transfer of syllabification rules from their native language. In order to determine if these speakers are in fact transferring syllable boundary assignment from their first language to their L2 English, epenthesis and syllable boundary assignment in Cairene and Iraqi must be explored. Thus, this chapter includes a detailed account of Itô's analysis of epenthesis in Cairene and Iraqi Arabic, then applies this analysis to forms from Cairene and Iraqi speakers' L2 English to determine if there is evidence for transfer.

Section 2.1 addresses syllables as a unit of prosodic phonology, while Section 2.2 examines the data from Cairene and Iraqi Arabic and explains the concept of syllable templates. Section 2.3 discusses and compares epenthesis in the two Arabic dialects, and Section 2.4 accounts for the difference in the site of epenthesis by discussing the directional mapping of syllable templates. Section 2.5 explores epenthesis in native Cairene or Iraqi Arabic speakers' non-native (L2) English, while Section 2.6 concludes this chapter.

2.1 The Syllable

The syllable is a prosodic unit in the Prosodic Hierarchy, which was first proposed by Selkirk (1980). The Prosodic Hierarchy consists of the Prosodic Word, Foot, Syllable, and Mora, as illustrated in (1).

(1) Prosodic Hierarchy

Prosodic Word (PrWd)

|

Foot

|

Syllable

|
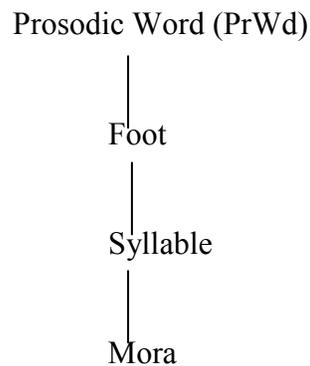
Mora

According to the Prosodic Hierarchy, the smallest prosodic unit is the mora. The syllable dominates the mora, as it is comprised of one or more moras. Dominating the syllable is the foot, which is normally composed of two syllables. At the top of the Prosodic Hierarchy is the Prosodic Word, which is usually made of multiple feet, although a single foot could function as a Prosodic Word.

2.2 The Data: Epenthesis in Cairene Arabic and Iraqi Arabic

This section begins with a pre-templatic analysis of epenthesis in Iraqi Arabic and Cairene Arabic because this pre-templatic analysis was the first in-depth examination of the data. In the pre-templatic analysis, the data used throughout Chapters 2 and 3 of this thesis are introduced. Subsection 2.2.2 presents the templatic analysis proposed by McCarthy (1981) and elaborated on by Itô (1986).

2.2.1 Pre-Templatic Analysis

Broselow (1976, 1980) examined a phenomenon of epenthesis exhibited in Iraqi Arabic and Cairene Arabic. While both dialects use epenthesis to break up consonant

clusters, the site of the epenthetic vowel differs between dialects. In Cairene Arabic, the

epenthetic vowel [i] is inserted before the third consonant of a triconsonantal cluster, while in

Iraqi Arabic the epenthetic [i] is inserted before the second consonant. An example of

epenthesis in both dialects is given in (2). The epenthetic [i] appears in bold in the output.

    (2) Example: 'I said to him' in Cairene and Iraqi Arabic (Broselow 1980)

        a. Cairene 'I said to him'

Input:	ʔul +	t	+ l +	u	
Interlinearization:	said + 1st singular + to + him				
Output:	[ʔult**i**lu]				

        b. Iraqi 'I said to him'

Input:	gil +	t	+ l +	a	
Interlinearization:	said + 1st singular + to + him				
Output:	[gil**i**tla]				

As (2) illustrates, epenthesis occurs to break up complex syllable margins, but not to prevent

consonants from being adjacent to each other. In (2a), [ʔult**i**lu], there is no epenthetic [i]

between the coda [l] and onset [t] because these adjacent consonants belong to different

syllables and thus do not comprise a complex syllable margin. The example forms in (2)

exhibit the pattern found when either dialect is faced with a word-medial triconsonantal

cluster. The pattern for both dialects is illustrated in (3), and the epenthetic vowel appears in

bold.

    (3) Pattern of epenthesis in Cairene Arabic and Iraqi Arabic (Broselow 1980)

        a. Cairene Arabic: $C_1 C_2 C_3 \rightarrow C_1 C_2 \textbf{V} C_3$

        b. Iraqi Arabic: $C_1 C_2 C_3 \rightarrow C_1 \textbf{V} C_2 C_3$

    Broselow (1980) argued that the motivation for epenthesis was the fact that, in these

two dialects, only certain types of syllables, could be in the surface form. What kinds of

syllables the dialect allowed in the surface form determined where epenthesis takes place.

While Broselow's (1980) analysis has been largely replaced by a templatic analysis, her proposal that only certain types of syllables are allowed by the dialect can be seen as the very beginnings of the templatic analysis that relies on a dialect having a strong preference for a certain syllable structure.

2.2.2 Reanalysis of the data using Syllable Templates

McCarthy (1981) presented an analysis of Arabic morphology where he argued that consonants and vowels are connected via a template where consonants are anchored to C-slots on the template and vowels are anchored to V-slots on the template. Consonants and vowels are mapped onto the pre-specified template directionally in accordance with a language's directionality parameter setting. While the unmarked direction for mapping is left-to-right because cross-linguistically more languages have the parameter setting left-to-right, a language may instead map consonants and vowels onto the template from right to left.

Junko Itô expounded on syllable templates in Arabic dialects in her dissertation *Syllable Theory in Prosodic Phonology* (1986). Her definition of a syllable template is given in (4) below.

> (4) Syllable Template (Itô 1986)
> > A kind of wellformedness condition defining the possible skeletal sequences
> > of a language, e.g. [CCVC].

A syllable template is the maximal syllable structure a language allows; this structure is language specific and pre-specified by a language's grammar. The syllable template appears in phonological texts as a sequence of consonants and vowels in square brackets, such as [CVC]. Then this template is mapped onto words either from right to left or from left to right.

Whether the syllable template is mapped from right to left or from left to right is also

determined by a directionality parameter.

2.3 The Syllable Template as Motivation for Epenthesis

According to Itô (1986, 1989), both Iraqi and Cairene dialects of Arabic possess the

syllable template [CVC]. Thus, clusters of three or more consonants are in violation of the

language's syllable template. However, the nonconcatenative morphology of Arabic,

regardless of the dialect, often causes strings of consonantal morphemes to occur

consecutively in the input, as is illustrated by the examples above in (2) where a single

Arabic word, either [ʔult**i**lu] or [gil**i**tla], expresses an entire English sentence that includes a

prepositional phrase, 'I said to him.'

Both examples in (2) contain a triconsonantal cluster word-medially. However, the

sequence CVCCCV that both examples have in the input does not conform to the syllable

template [CVC] because whether it is syllabified CVC.CCV or CVCC.CV, there is a complex

syllable margin. Hence, the vowel [i] is epenthesized to break up the consonant cluster that

causes the syllables not to conform to the syllable template [CVC].

2.3.1 Epenthesis in Cairene Arabic

While both Cairene and Iraqi Arabic use epenthesis to break up this word-medial

triconsonantal cluster, the examples in (2) demonstrate that the site of epenthesis varies

according to the dialect, which is due to a different parameter setting for directionality

between the two dialects. When syllable boundaries are assigned in Iraqi Arabic, the syllable

template is mapped from right to left because the parameter setting for directionality is right

to left in Iraqi Arabic. In Cairene Arabic syllable boundaries are assigned directionally from

left to right, resulting in the epenthetic vowel being inserted between the second and third

consonant, which is illustrated in (5).

(5) Epenthesis in triconsonantal clusters in Cairene Arabic
   a. Pattern: $C_1 C_2 C_3 \rightarrow C_1 C_2 V C_3$

   b. Example: [ʔul.**ti**.lu] 'I said to him'
   Input: /ʔultlu/ $CVC_1 C_2 C_3 V$
   Output: [ʔult**i**lu] $CVC_1 C_2 VC_3 V$
   Syllabified form: ʔul.**ti**.lu $CVC_1 . C_2 V . C_3 V$

As is illustrated in (5), epenthesis of a vowel between C_2 and C_3 eliminates the triconsonantal

cluster as well as eliminating any complex syllable margins and resulting in only a single

coda in this trisyllabic form.

2.3.2 The Onset Principle

Notice that in the output in (5), both C_2 and C_3 syllabify as onsets rather than codas

due to the Onset Principle, which is defined in (6) below.

(6) Onset Principle (Ito 1989)
   Syllables that lack an onset should be avoided.

When syllabifying [ʔult**i**lu], since syllables that lack onsets *can* be avoided, they are in order

to obey the Onset Principle; therefore, the output is [ʔul.**ti**.lu]. It should be noted that the

Onset Principle stems from the notion of markedness: onsetless syllables are cross-

linguistically allowed in far less languages than syllables with onsets. Thus, the Onset

Principle reflects a universal avoidance of onsetless syllables. In (7) other possible

syllabifications of this form are given in order to demonstrate how they do not conform to the

Onset Principle.

(7) Alternative Syllabifications of [ʔultilu]

 a. *ʔult.**il**.u CVC_1C_2.**V**C_3.V

 b. *ʔult.**i**.lu CVC_1C_2.**V**.C_3V

 c. *ʔul.t**i**l.u CVC_1.C_2**V**C_3.V

 The form *[ʔult.**il**.u] in (7a) is ungrammatical for two reasons: first, the initial syllable

has a complex coda, so it does not conform to the syllable template [CVC]. Secondly, both of

the following syllables fail to abide by the onset principle because C_2 and C_3 have been

syllabified in coda positions. These two onsetless syllables can easily be avoided if C_2 and

C_3 are syllabified as onsets rather than codas. Similarly, the form *[ʔult.**i**.lu] is

ungrammatical for the same two reasons. Like (7a), the first syllable has a complex coda,

which does not conform to the syllable template [CVC]. While it only has one syllable that

lacks an onset rather than two, this syllable does not obey the Onset Principle because its lack

of an onset can be avoided if C_2 were syllabified as an onset rather than part of the complex

coda contained by the first syllable.

 While the form *[ʔul.t**i**l.u] in (7c) is slightly more preferable than the forms in (7a)

and (7b) because it does not have any complex syllable boundaries and contains only one

onsetless syllable, it is still ungrammatical. The final syllable, which lacks an onset, does not

abide by the Onset Principle because this onsetless syllable can be avoided if C_3 is syllabified

as an onset of the final syllable rather than a coda of the previous syllable. Thus, the form is

syllabified [ʔul.t**i**.lu] in order to avoid having syllables that lack onsets while also avoiding a

word-medial triconsonantal cluster and any complex syllable margins. Although Itô

proposes the syllable template [CVC], the syllable structure CVC is avoided in order to ensure that all syllables have onsets.

2.3.3 Iraqi Epenthesis

Similar to the epenthesis employed in Cairene Arabic, epenthesis in Iraqi Arabic is used to avoid word-medial triconsonantal clusters which lead to complex syllable margins. However, unlike epenthesis in Cairene Arabic where the epenthetic vowel is inserted between C_2 and C_3, in Iraqi Arabic the epenthetic vowel is inserted between C_1 and C_2, as is evidenced by the example in (8).

(8) Epenthesis in triconsonantal clusters in Iraqi Arabic

    a. Pattern: $C_1 C_2 C_3$➔C_1 **V** $C_2 C_3$

    b. Example: [gil**i**tla] 'I said to him'
      Input: /gil+t+la/ $CVC_1 C_2 C_3 V$
      Output: [gil**i**tla] CVC_1 **V** $C_2 C_3 V$
      Syllabified form: [gi.l**i**t.la] $CV.\,C_1$ **V** $C_2.\,C_3 V$

Like the examples in (7), [gil**i**tla] could be syllabified differently than [gi.l**i**t.la], but all other syllabifications result in an onsetless syllable, which should be avoided in order to obey the Onset Principle. Thus, the word is syllabified $CV.\,C_1$ **V** $C_2.\,C_3 V$, which is slightly different from the syllabification of [ʔul.t**i**.lu] in Cairene. A side-by-side comparison is provided in (9), and the epenthetic vowel is in bold.

(9) Comparison of syllabification for 'I said to him' in both dialects

Dialect	Form	Syllable Skeleton
Cairene	[ʔul.t**i**.lu]	$CVC_1.C_2$**V**$.\,C_3 V$
Iraqi	[gi.l**i**t.la]	$CV.\,C_1$ **V** $C_2.\,C_3 V$

As the table in (9) illustrates, while both dialects use epenthesis of [i] in order to break up a triconsonantal word-medial cluster, the site of epenthesis is different. Because the epenthesis occurs in a different place, the syllabification of the word varies according to dialect. However, it is worth noting that the forms from both dialects contain one CVC syllable and two CV syllables; it is simply the order of the syllables that varies according to dialect. The variation of the site of epenthesis, Itô (1986) argues, is due to the directionality of the mapping of the [CVC] template onto the form.

2.4 Directional Mapping of the Arabic Syllable Template

In order to examine how directionality of mapping the [CVC] template affects the surface form, the examples from (2) are illustrated again in (10).

(10) Example: 'I said to him' in Cairene and Iraqi Arabic (Broselow 1980)

a. Cairene 'I said to him'
Pattern of Epenthesis: $C_1 C_2 C_3 \rightarrow C_1 C_2 \mathbf{V} C_3$

Input:	ʔul +	t	+ l +	u
Interlinearization:	said + 1st singular + to + him			
Output:	[ʔult**i**lu]			

b. Iraqi 'I said to him'
Pattern of Epenthesis: $C_1 C_2 C_3 \rightarrow C_1 \mathbf{V} C_2 C_3$

Input:	gil +	t	+ l +	a
Interlinearization:	said + 1st singular + to + him			
Output:	[gil**i**tla]			

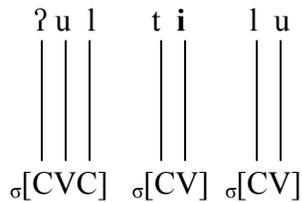In the examples in (10) 'I said to him,' in both dialects, the consonant cluster is the same: /l-t-l/; however, in Cairene Arabic this consonant cluster becomes [lt**i**l], causing the [t] to become an onset and the final [l] to become a coda. In Iraqi Arabic, the consonant cluster /l-t-l/ becomes /l**i**tl/, where the initial [l] is an onset, the t is a coda, and the final [l] is the onset for

the next syllable. The syllabification of the output in both dialects is illustrated in (11). Note

that while alternative syllabifications of the form are possible, the surface syllabification

conforms to the Onset Principle discussed in Section 2.3.2.

(11)   Syllabification of 'I said to him' in both Arabic dialects

      a. Cairene Arabic   b. Iraqi Arabic

ʔ u l   t **i**   l u   g i   l **i** t   l a

$_\sigma$[CVC] $_\sigma$[CV] $_\sigma$[CV] $_\sigma$[CV] $_\sigma$[CVC] $_\sigma$[CV]
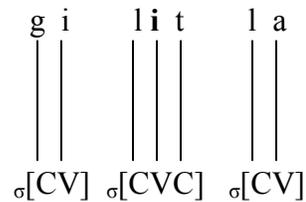
While both dialects use epenthesis of [i][1] to break up the triconsonantal cluster, resulting in a

trisyllabic word consisting of two CV syllables and a single CVC syllable, the place of

insertion is different. In both cases the [i] is inserted in a place that productively breaks up

the triconsonantal cluster, but because the [i] is inserted after the second consonant in

Cairene Arabic and before the second consonant in Iraqi Arabic, the syllable order is

different.

Itô (1986, 1989) argues that the reason for the variation in the site of epenthesis is the

mapping of the syllable template [CVC] onto a word. She points out that in other areas of

prosodic phonology, such as metrical theory, reduplication, tonology, and others, languages

necessarily contain a directional parameter in their grammar. In the case of syllable

templates, this parameter determines which direction the syllable template will be mapped

onto a word. An analysis of epenthesis that considers the directional mapping of a syllable

---

[1] This paper does not focus on the features of the epenthetic vowel or the pervasiveness of [i] as an epenthetic vowel. However, Galal (2004) discusses features of the epenthetic vowel [i] and proposes that [i] is chosen as the default for epenthetic vowels due to its universally unmarked features.

template conforms to other theories within Prosodic Phonology that also rely on

directionality (Itô 1986, 1989).

2.4.1 Mapping the Syllable Template in Cairene Arabic

Keeping this principle of directionality in mind, the explanation why epenthesis

occurs in a different position in Cairene Arabic than Iraqi Arabic is that the two dialects have

different parameter settings for directionality. The Cairene dialect maps the syllable template

[CVC] from left to right, while the Iraqi dialect maps the syllable template [CVC] from right

to left. In (12a) this syllable mapping is demonstrated on the input /ʔul+t+l+u/, the Cairene

word from (10a) meaning 'I said to him,' while (12b) shows the syllable mapping after

epenthesis has occurred, making the output [ʔultilu].

(12)   Syllable Template Mapping in Cairene Arabic with Directionality Parameter

setting L➔R

a.   Input: /ʔul+t+l+u/

```
ʔ u l      t Ø•      l u•
| | |      | | |      | | |
| | |      | | |      | | |
| | |      | | |      | | |
| | |      | | |      | | |
σ[CVC]  σ[CVC]  σ[CVC]
```
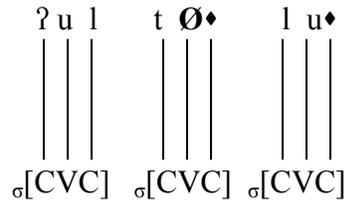
Mapping:➔   ➔   ➔   ➔

b.   Output: [ʔultilu]

```
ʔ u l      t i •      l u •
| | |      | | |      | | |
| | |      | | |      | | |
| | |      | | |      | | |
| | |      | | |      | | |
σ[CVC]  σ[CVC]  σ[CVC]
```
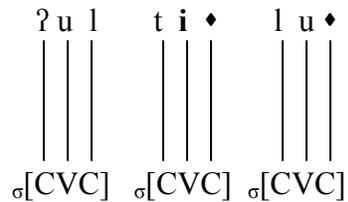
Mapping:➔   ➔   ➔   ➔

In (12a) Ø represents where a vowel is missing when the syllable template [CVC] is mapped from left to right, and • represents where a consonant is missing in order to satisfy the [CVC] template. Notice that in both cases where a consonant is missing, the missing consonant is in the coda position, not the onset position, which indicates two things about the Cairene dialect: 1) Having an onset is a higher priority than having a coda, and 2) Breaking up syllable-internal consonant clusters is a higher priority than ensuring that every syllable matches the [CVC] template by having a coda. This may have to do with the fact that syllable internal consonant clusters are universally marked and thus avoided; it appears that maintaining unmarked syllable margins is more important than conforming to the syllable template.

In (12b), after epenthesis has occurred, the syllable template [CVC] can be mapped directionally from left to right onto the output without any consonant clusters or missing syllable nuclei. Had the syllable template been mapped onto the input from right to left, the result would be *ʔulitlu, as (13) illustrates, where (13a) shows the syllable template [CVC] being mapped from right to left on the input /ʔul+t+l+u/, and (13b) shows the output *ʔulitlu after epenthesis to satisfy the syllable template and avoid syllable-internal consonant clusters.

    (13) Syllable Template Mapping in Cairene Arabic with *incorrect* Directionality

    Parameter Setting R➜L

        a. Input: /ʔul+t+l+u/

            ʔ u ◆   l Ø t   l u ◆

            σ[CVC] σ[CVC] σ[CVC]
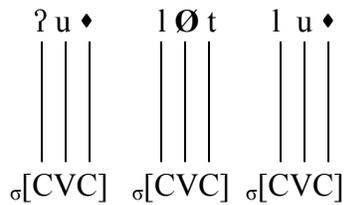
          Mapping: ← ← ← ←

        b. Output: *ʔulitlu

            ʔ u ◆   l i t   l u ◆

            σ[CVC] σ[CVC] σ[CVC]
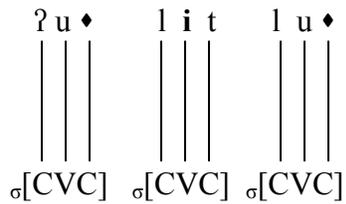
          Mapping: ← ← ← ←

It is important to note that when the syllable template is mapped directionally from right to left, that does not change the fact that the coda occurs to the right of the nucleus and the onset occurs to the left of the nucleus. Right-to-left mapping causes the rightmost CV(C) to form

the rightmost syllable, followed by the CV(C) immediately to the left of that syllable, etc.

Thus, the first syllable to be mapped in *[ʔul**i**tlu] is /lu/; in accordance with the Onset

Principle, the next syllable is [l**i**t] and not [**i**t], and the final syllable to be mapped is [ʔu],

which lacks a coda because the consonant following the nucleus of that syllable was already

mapped as an onset onto the syllable that follows it. While this thesis focuses on a single

prosodic unit, the syllable, the role that moras play in templatic syllabification should be

further investigated because Itô's syllable template [CVC] is comprised of two moras: the

onset and nucleus comprise one mora, while the coda is a second mora. If the template is

[CV], there is no second mora. The presence of a second mora is especially important when

the syllable template [CVC] is mapped from right to left because if the final syllable lacks a

coda, making it a monomoraic syllable, then the first syllable will misalign with the syllable

template.

The difference caused by the direction that the syllable template is mapped, as

illustrated in the contrast between (12) and (13), is that only when the syllable template is

mapped from left to right does the correct form, exhibited in (12b), surface in the output.

When the syllable template is mapped from right to left, as is demonstrated in (13), the

incorrect surface form seen in (13b) emerges. Thus, the directionality parameter, when it is

set L➔R, can account for the correct surface form in native words that contain triconsonantal

clusters.

2.4.2 Mapping the Syllable Template in Iraqi Arabic

In Iraqi Arabic, the directionality parameter must have a different setting because a

different surface form emerges, even though both dialects have the same input as far as CV

sequence is concerned. Logically, if the directionality parameter in Iraqi Arabic is not set for

L➜R, it must be set for R➜L; indeed, as (14) illustrates, when the syllable template [CVC]

is mapped from right to left onto the word, the correct surface form emerges.

(14) Syllable Template Mapping in Iraqi Arabic with Directionality Parameter

Setting R➜L

a. Input: /gil+t+l+a/

g i ◆   l Ø t   l a ◆
σ[CVC] σ[CVC] σ[CVC]
Mapping:⬅ ⬅ ⬅ ⬅

b. Output: gil**i**tla
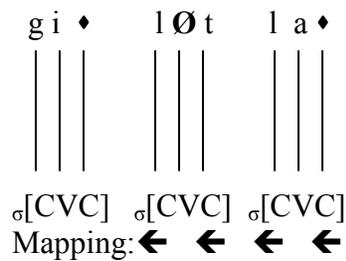
g i ◆   l **i** t   l a ◆
σ[CVC] σ[CVC] σ[CVC]
Mapping:⬅ ⬅ ⬅ ⬅
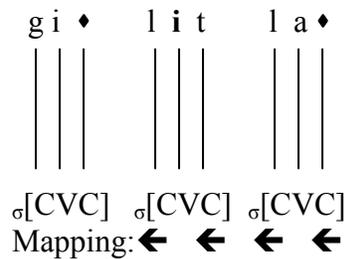
When the syllable template [CVC] is mapped onto the Iraqi input /gil+t+l+a/ the empty

vowel slot represented by Ø occurs in the second syllable between onset [l] and coda [t].

When epenthesis occurs, the [i] is inserted into this empty vowel slot in order to separate the

same syllable-internal consonant cluster that occurs in the Cairene input for 'I said to him.'

Thus, the directionality parameter, when applied to the mapping of syllable templates, can

account for the variation in syllabification and epenthesis in both Cairene Arabic and Iraqi

Arabic.

2.5 Epenthesis in Cairene and Iraqi Arabic speakers' L2 English

In this section I explore Broselow's (1983, 1984, 1988) study of how native speakers of Cairene Arabic or Iraqi Arabic pronounce English words containing consonant clusters. Subsection 2.5.1 summarizes Broselow's study of epenthesis in Cairene and Iraqi speakers' non-native (L2) English, while subsection 2.5.2 examines to what extent this epenthesis is transferred from the speakers' native (L1) Arabic dialect to their non-native (L2) English.

2.5.1 Epenthesis data of Cairene and Iraqi Arabic Pronunciation of L2 English

The phenomenon of using epenthesis to break up consonantal clusters is exhibited not only in the speakers' pronunciation of native words, but also in their pronunciation of L2 English, as Broselow (1983, 1984, 1988) discusses using the data presented in (15). While Broselow (1983, 1984, 1988) uses a rule-based approach to account for the data rather than the templative syllabification approach Itô uses to explain Cairene and Iraqi L1 data, her analysis shares many similarities with Itô's in that she focuses on allowed syllable structures in the language and directionality.

(15) Data exhibiting epenthesis in Cairene and Iraqi Arabic speakers' L2 English

(Broselow 1983, 1984, 1988)

English Word	Cairene Arabic	Iraqi Arabic
'floor'	[filo:r]	[ʔiflo:r]
'plastic'	[bilastik]	not reported
'plane'	not reported	[ʔible:n]
'three'	[Ɵiri:]	[ʔiƟri:]
'translate'	[tiransilet]	not reported
'study'	[ʔistadi]	[ʔistadi]
'Fred'	[firɛd]	[ʔifrɛd]
'children'	[childiren]	[tʃilidren]

One example is the English word 'floor,' which contains a word-initial biconsonantal cluster.

Although the speakers are dealing with a biconsonantal cluster rather than a triconsonantal

cluster, the process of epenthesis remains almost the same. The variation in epenthesis

between Cairene Arabic and Iraqi Arabic is illustrated in (16) below.

(16)   Epenthesis variation in L2 English biconsonantal clusters

a. Cairene Arabic: $_\sigma[C_1C_2 \rightarrow {}_\sigma[C_1iC_2]$

b. Iraqi Arabic: $_\sigma[C_1C_2 \rightarrow {}_\sigma[ʔiC_1] \, _\sigma[C_2$

In the case of biconsonantal clusters, the [i] is inserted between the two consonants in

Cairene Arabic and before the first consonant in Iraqi Arabic. The pronunciation of 'floor' in

both dialects is illustrated in (17) below.

(17)   Pronunciation of 'floor' in both dialects

a. Cairene Arabic: [filo:r]   b. Iraqi Arabic: [ʔiflo:r]

<pre>
f   i   l o: r   ʔ   i   f   l   o: r
σ[C V] σ[CVC]   σ[C V C] σ[C V C]
</pre>

The case in (17) where the epenthetic [i] is used to break up a biconsonantal cluster reveals

different results than when epenthesis is used to break up triconsonantal clusters, as in

examples in Sections 2.2, 2.3, and 2.4, where both dialects used epenthesis the same number

of times and ended with the same amount of CV and CVC syllables. In (17b) the Iraqi

dialect also uses epenthesis to insert a glottal stop syllable and word-initially. This

epenthesis is motivated by the Onset Principle discussed in 2.3.2: in Arabic, a syllable must

have an onset. The first syllable in the Iraqi pronunciation of 'floor,' without the epenthetic

glottal stop, would be VC, which the Onset Principle prohibits; thus, a glottal stop is inserted

word-initially to satisfy the Onset Principle, as well as the syllable template [CVC]. The

Cairene pronunciation [filo:r] does not require an epenthetic glottal stop because both the

syllables in it already have onsets, thus satisfying the Onset Principle. However, it is worth

noting that the first syllable, [fi], could be seen as violating the syllable template [CVC] because it lacks a coda; thus, it appears that the Onset Principle is somehow a higher priority in this dialect's grammar than the syllable template. This concept of ranking some principles as more important than others will be discussed in terms of constraint ranking in Optimality Theory in Chapter 3.

2.5.2   Transfer of Epenthesis Rules from Arabic Dialect to L2 English

Sections 2.2, 2.3, and 2.4 explored how Cairene Arabic and Iraqi Arabic use epenthesis to break up triconsonantal clusters and avoid complex syllable margins. However, the examples from speakers' L2 English in (15) contain biconsonantal clusters, with the exception of 'translate' and 'children.' Broselow (1983, 1984, 1988) explores whether the epenthesis rules for the Arabic speakers' L2 English is an example straightforward transfer from their native dialect.

Although she does not specify the rate at which speakers use epenthesis to break up consonant clusters in their L2 English, Broselow (1983) mentions that the Iraqi speakers had less difficulty compared to the Cairene speakers when pronouncing English words that began with a biconsonantal cluster. While her data include many examples of Iraqi pronunciations that use epenthesis to break up a word-initial biconsonantal cluster, her statement regarding their level of difficulty indicates that Iraqi speakers do not insert a vowel between two word-initial consonants in English words 100% of the time. However, this lack of consistency may be due to the fact that in Iraqi Arabic there are often two acceptable ways to say a form that contains an initial biconsonantal cluster, as is shown in (18).

(18)   Acceptable forms of words beginning with a biconsonantal cluster in Iraqi

Arabic (Broselow 1983)

Word	Acceptable Form 1 (no epenthesis)	Acceptable Form 2 (epenthesis)
'cloth'	qma:ʃ	ʔiqma:ʃ
'two'	θne:n	ʔiθne:n

Thus, Broselow concludes that epenthesis in Iraqi speakers' L2 English is straightforward

transfer of an epenthesis rule from their native dialect.

Epenthesis exhibited in English spoken by native speakers of Cairene Arabic appears

to come from transfer of rules in the speakers' native language because, unlike Iraqi Arabic,

word-initial biconsonantal clusters are prohibited (Broselow 1980, 1983, 1984). However,

Broselow struggles to explain *why* the epenthesis site is in between the two clustered

consonants rather than before the first of the two consonants, as it is in Iraqi.

Broselow's conclusion that transfer is the reason for Cairene and Iraqi speakers'

epenthesis in L2 English supports the Contrastive Analysis Hypothesis, which would predict

that when a speaker's native language does not allow word-initial biconsonantal clusters,

such as Cairene Arabic, that speaker will have more difficulty with word-initial

biconsonantal clusters in the target language. Likewise, CAH would predict that since Iraqi

Arabic allows word-initial biconsonantal clusters, Iraqi speakers would have less difficulty

producing word-initial biconsonantal clusters in English. However, it is important to note

that factors other than transfer from the native language could cause Cairene and Iraqi

speakers' epenthesis in English word-initial biconsonantal clusters.

2.5.3 Other Explanations for Cairene and Iraqi Speakers' Epenthesis in L2 English

The Markedness Differential Hypothesis (Eckman 1977) predicts that forms in the target language that are universally more marked, that is, occurring less frequently cross-linguistically, will be more difficult for the speaker to acquire. Consonant clusters are universally marked; hence, word-initial biconsonantal clusters are more marked than word-initial simple onsets. The markedness of consonant clusters could cause speakers to have difficulty with them in their target language even if consonant clusters exist in their native language. Thus, native speakers of languages that allow consonant clusters may still exhibit epenthesis when producing forms containing consonant clusters in their target language. In this case, the motivation for epenthesis is not transferred from the native language, nor is it a product of the target language; rather, this motivation seems to arise from speakers' interlanguage, independent of the native language and target language. The interlanguage system is a language learning mechanism that establishes a rate of development based on markedness, or typological properties. Thus interlanguage rules, as they are often called, often seem to stem from markedness, or what forms occur more frequently cross-linguistically. Since consonant clusters are more marked cross-linguistically than simple syllable margins, an L2 learners' interlanguage may prohibit consonant clusters, regardless of whether the learners' L1 allows consonant clusters.

Between the Markedness Differential Hypothesis, which claims that universal markedness rather than native language transfer is responsible for the amount of difficulty L2 learners have acquiring a form, and the Contrastive Analysis Hypothesis, which relies on the differences between the native language and the target language to explain L2 learners' difficulty with certain forms, is the Similarity Differential Hypothesis (Major 1997). The Similarity Differential Hypothesis relies on contrasting the native language with the target

language, like the Contrastive Analysis Hypothesis. However, according to the Similarity

Differential Hypothesis, when a form in the target language is greatly different from any

form in the native language, the learner will have little difficulty acquiring that form; the

difficulty arises when a form in the target language is very similar—but not identical to—a

form in the native language. Thus, if Iraqi Arabic allows word-initial biconsonantal clusters,

making it similar to English in that aspect, but the biconsonantal clusters allowed in Iraqi

Arabic were different from English, the speakers would have more difficulty acquiring

English word-initial biconsonantal clusters than speakers of a native language that does not

allow word-initial biconsonantal clusters at all.

While this thesis does entertain Broselow's notion that syllabification in the native

language is the reason for epenthesis and the site of epenthesis in Cairene and Iraqi speakers'

L2 English, her Contrastive Analysis approach should be met with some skepticism. In order

to determine if the Cairene and Iraqi speakers' pronunciation of English words containing

consonant clusters is indeed due to transfer, native speakers of languages that allow

consonant clusters similar to English should be studied. If native speakers of languages that

allow consonant clusters similar to English also use epenthesis to break up English consonant

clusters, that would be evidence to support a non-transfer account of this epenthesis. For this

reason, another dialect of Arabic where consonant clusters frequently occur in different

positions will be examined later in this thesis; data where these speakers do not use

epenthesis could be interpreted as evidence supporting that this epenthesis strategy is merely

transfer. However, if these speakers do use epenthesis when dealing with English consonant

clusters, it could indicate that the epenthesis strategy has more to do with a different factor,

such as markedness or similarity between the native and target language forms, other than transfer.

2.5.4 Epenthesis in Cairene and Iraqi speakers' L2 English

Although later chapters in this thesis explore the possibility that transfer is not the reason Cairene and Iraqi speakers use epenthesis to break up consonant clusters in English, the possibility should be explored. Thus, in this section Itô's analysis (1986, 1989) of syllable template-mapping in Cairene and Iraqi Arabic is used in order to account for why Cairene Arabic speakers insert the epenthetic vowel [i] between the first and second consonant. If Itô's template-mapping can accurately account for epenthesis in Cairene and Iraqi speakers' L2 English, the speakers may have transferred this syllable template-mapping approach from their native language to the target language. However, even if Ito's syllable-template mapping approach can account for the L2 forms listed by Broselow, factors such as markedness may still be motivating epenthesis or helping to determine the best site for epenthesis. These possibilities will be explored in great depth in Chapter 3. In this section, the directional syllabification and syllable templates from Cairene and Iraqi Arabic are applied to forms from Cairene and Iraqi speakers' L2 English. Following the format of (12), the word 'floor' is analyzed for Cairene Arabic using Itô's syllable-template mapping approach.

(19) Syllable Template Mapping in Cairene Arabic with Directionality Parameter

setting L➔R

    a. Input: /flo:ɹ/

      f Ø ♦   l o: r

      σ[CVC] σ[CVC]
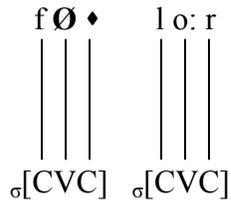
      Mapping:➔ ➔ ➔ ➔

    b. Output: [filo:r]

      f i ♦   l o: r

      σ[CVC] σ[CVC]
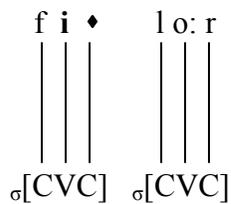
      Mapping:➔ ➔ ➔ ➔

Like the illustration in (12), Ø indicates a missing vowel in the input, marking where

epenthesis will occur, while ♦ indicates where the syllable template has not been satisfied

with a consonantal coda. When the Cairene Arabic syllable template [CVC] is mapped from

left to right, the word-initial [f] fills the onset C-slot of the syllable template, which requires

that a vowel follow this [f] in order to follow the syllable template. Thus, the epenthetic

vowel [i] is inserted after the first consonant, [f], rather than before it. The end result is the

syllabified form [fi.lo:r] where [l] is syllabified as an onset rather than a coda of the first

syllable in order to obey the Onset Principle described in Section 2.3.2. The Onset Principle

can also be seen as motivation for the speakers not saying *[iflo:r] where the word does not

begin with an onset.

After using the syllable template-mapping approach, it appears that epenthesis in word-initial biconsonantal clusters of English words could be at least partially a result of transfer from Cairene and Iraqi speakers' native dialect of Arabic. However, while Ito's templatic syllabification account of Cairene and Iraqi Arabic can be applied to Cairene and Iraqi L2 English forms, markedness may still be a motivation for these speakers' syllabification and epenthesis. As Broselow (1983, 1984, 1988) admits, transfer cannot entirely account for Cairene speakers' epenthesis in their L2 English. One example she gives is the Cairene speakers' placement of the epenthetic vowel between C1 and C2 in a word-initial biconsonantal cluster because in Cairene Arabic, word-initial biconsonantal clusters usually undergo epenthesis before C1. Thus, if the Cairene speakers were merely transferring strategies from their L1 into their L2 English, they should pronounce 'floor' as [ʔif.lo:r].

2.6 Conclusion

While speakers of both Iraqi and Cairene Arabic use epenthesis to break up consonant clusters that result in complex syllable margins, where the epenthesis takes place differs according to dialect. The phenomenon of epenthesis can be explained using syllable templates, where the syllable template for both dialects is [CVC]. In order to explain why epenthesis occurs in a different place depending on the dialect, the concept of directionality must be applied to the syllable template analysis. The result is an analysis where the syllable template [CVC] is mapped onto each syllable either from Left to Right, as is the case with Cairene Arabic; or from Right to Left, as is the case with Iraqi Arabic.

This chapter applied Ito's analysis of Cairene and Iraqi Arabic to Cairene and Iraqi pronunciations of L2 English. One explanation for epenthesis in these speakers' L2 English

could be the syllable template [CVC] or [CV(C)] and the direction it is mapped is transferred

from Cairene and Iraqi speakers' native dialect to their L2 English, causing non-native

pronunciations of words containing complex syllable margins, such as the word 'floor.' As

is the case with their native dialects, speakers of these dialects use epenthesis to break up the

[fl] consonant cluster, but the epenthesis occurs in a different place depending on the dialect.

Thus, Iraqi speakers would pronounce 'floor' as [ʔiflo:r] while Cairene speakers would

pronounce 'floor' as [filo:r].

However, the analysis assuming transfer provided in this chapter is not the only way to

account for epenthesis in Cairene and Iraqi speakers' L2 English. While these speakers' use

of epenthesis could be attributed to transfer from their L1, their syllable errors could also be

accounted for with markedness. As the Markedness Differential Hypothesis would argue,

these speakers' process of epenthesis could be due to the fact that consonant clusters are

universally marked. One way to try to separate the role of transfer from the role of

markedness in these speakers' pronunciation of English words containing consonant clusters

is by using Optimality Theory (OT).

In Chapter 3 the syllable errors that Broselow (1983, 1984, 1988) attributed to transfer

will be accounted for in OT by using a hierarchy of markedness and faithfulness constraints,

thus taking a closer look at the role markedness plays in determining the Cairene and Iraqi

speakers' output of English words containing consonant clusters. OT is especially valuable

for analyzing interlanguage forms because it focuses on the interaction of markedness and

faithfulness to a form's input. OT's focus on markedness causes it to blend well with the

Markedness Differential Hypothesis because OT illustrates how different constraints

concerning markedness affect the output of a form.

CHAPTER 3: OPTIMALITY THEORY APPROACH TO EPENTHESIS DATA

3.0 Introduction

In the previous chapter, Ito's (1986, 1989) analysis of Cairene and Iraqi Arabic

epenthesis and templatic syllabification was presented. Broselow (1983, 1984) concludes

that Cairene and Iraqi speakers' use of epenthesis in their L2 English is due to transfer of

their strategy of epenthesis to break up consonant clusters in their native language. Broselow

(1983, 1984) goes so far as to propose the Syllable Structure Transfer Hypothesis[2]. In the

previous chapter, I adopted Broselow's assumption of transfer and applied templatic

syllabification to the Iraqi and Cairene forms for 'floor' and 'children.'

While templatic syllabification transferred from their L1 is a possible explanation for

these speakers' use of epenthesis with English consonant clusters, the Markedness

Differential Hypothesis should be explored as another possible explanation for L2 English

speakers' pronunciations of consonant clusters. Anderson (1987) compared how Cairene

speakers syllabify their L2 English with Chinese speakers to see if MDH rather than CAH

could be used to explain syllabification errors in speakers' L2 English. She found Cairene

speakers had little difficulty with English word-initial consonant clusters, even though word-

initial clusters are not allowed in Cairene Arabic. In fact, the Cairene speakers seemed to

have less difficulty with word-initial clusters, which are less marked than word-final clusters,

than they had with word-final clusters. CAH would predict that the Cairene speakers would

have more difficulty with the word-initial clusters because they don't have this structure in

their native language; however, markedness seemed to be a more important factor in the level

of difficulty the speakers had since they had less difficulty with the less-marked form that

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[2] It should be noted that in Cairene Arabic, word-final consonant clusters are allowed (Broselow 1976), and word-initial consonant clusters appear in Iraqi Arabic (Broselow 1983, 1984), which could be considered evidence to weaken the argument for the Syllable Structure Transfer Hypothesis.

doesn't occur in their L2. Her study supported the argument that transfer alone is insufficient to explain L2 English speakers' syllable errors.

Optimality Theory is invaluable in examining the role markedness plays in a speaker's output because of the pivotal role markedness constraints play in the theory; thus, this chapter uses Optimality Theory to analyze L2 forms produced by Cairene and Iraqi speakers. The table in (1) reviews examples of epenthesis from Cairene and Iraqi Arabic speakers' English.

(1) Data exhibiting epenthesis in Cairene and Iraqi Arabic speakers' L2 English (Broselow 1983, 1984, 1988)

English Word	Cairene Arabic	Iraqi Arabic
a. 'floor'	[filo:r]	[ʔiflo:r]
b. 'plastic'	[bilastik]	not reported
c. 'plane'	not reported	[ʔible:n]
d. 'three'	[θiri:]	[ʔiθri:]
e. 'translate'	[tiransilet]	not reported
f. 'study'	[ʔistadi]	[ʔistadi]
g. 'Fred'	[firɛd]	[ʔifrɛd]
h. 'children'	[tʃildiren]	[tʃilidren]

By using a combination of faithfulness and well-formedness constraints in OT, I will demonstrate how the interaction of these constraints results in the pronunciations shown in (1). Note that the OT tableaux are designed only to explain epenthesis and syllabification,

not issues of vowel and consonant change such as /p/ being pronounced [b] in the words 'plane' and 'plastic.'[3]

In Section 3.1 I provide a brief introduction to OT; Section 3.2 continues this introduction by discussing one of the fundamental tenets of OT: faithfulness and well-formedness constraints. Only constraints that are relevant to this analysis are discussed. Section 3.3 discusses the ranking of relevant constraints in both Cairene and Iraqi Arabic, and Section 3.4 explains an alternate analysis proposed by Mester and Padgett (1994) that incorporates Itô's (1986, 1989) directional templatic syllabification into an OT constraint. This chapter is concluded in Section 3.5.

3.1 Optimality Theory

Optimality Theory was developed and introduced to the field of Phonology by Prince and Smolensky (1993) and McCarthy and Prince (1993). According to Optimality Theory, there is an infinite number of candidates for the possible output of a form. A hierarchy of well-formedness constraints and faithfulness constraints interact in order to eliminate candidates until the optimal candidate, or the candidate that has the fewest violations of the constraints, emerges. Unlike rule-based phonology where various rules affect the input in a sequential order, in Optimality Theory all the constraints act upon the input simultaneously. The well-formedness constraints are at odds with the faithfulness constraints, and the ranking of the constraints determines which constraints are more violable. The optimal candidate often violates some of the constraints in the hierarchy, but it usually violates constraints that are ranked lower in the hierarchy, or it has fewer violations of higher ranked constraints than other candidates. While all constraints in Optimality Theory are universal and some are

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[3] For a detailed comparison of the English versus Arabic sound inventory, and the mapping of English consonants and vowels to their Arabic counterparts, see Galal's (2004) "An OT approach to loanword adaptation in Cairene Arabic."

commonly found as high-ranking constraints in a variety of languages, this thesis will only discuss constraints that are necessary for analyzing Arabic data regarding consonant clusters.

<div align="center">3.2 Optimality Theory Constraints</div>

Constraints in Optimality Theory fit into two categories: well-formedness, or markedness, constraints and faithfulness constraints. It is this focus on well-formedness constraints that causes Optimality Theory to be easily integrated into the Markedness Differential Hypothesis. Well-formedness constraints deal with how universally marked different forms are, such as consonant clusters in the onset, consonant clusters in the coda, etc. Forms that are cross-linguistically avoided are considered marked or ill-formed. Optimality Theory contains numerous constraints that express universal markedness principles.

The other type of constraints in OT is faithfulness constraints, which focus on the output being faithful to the input. While constraints are universal, many constraints are ranked so low in a language's hierarchy that they are irrelevant. Such constraints that only appear relevant in very few languages are still being proposed in order to use OT to explain phenomena in more languages. In order to explain epenthesis in Cairene and Iraqi Arabic speakers' L2 English, several commonly used well-formedness constraints, as well as two faithfulness constraints, are necessary. In this section, the constraints and their hierarchy is established for Cairene speakers' L2 English. Section 3.3 applies this hierarchy to Iraqi speakers' L2 English and proposes an alteration to one of the constraints in order to account for how Iraqi outputs of English words containing word-initial biconsonantal clusters and word-medial triconsonantal clusters differ from Cairene outputs of the same input.

3.2.1 *COMPLEX Constraint

First and foremost, the Cairene and Iraqi dialects require a constraint concerning consonant clusters at syllable margins. This is a well-formedness constraint, as consonant clusters at syllable margins are universally marked. The constraint that describes the avoidance of complex onsets and codas is *COMPLEX, which was first proposed by Prince and Smolensky (1993). This constraint is defined in (2) below.

(2) *COMPLEX (Prince and Smolensky 1993)
No complex onsets or codas.

The constraint *COMPLEX indicates that a language should avoid consonant clusters at syllable margins. A small tableau illustrating how this constraint is violated is provided in (3). The most faithful candidate is candidate a because the only difference between candidate a and the input is the [r]. However, candidate a violates *COMPLEX, which is indicated with the symbol *. This violation causes candidate a to be eliminated, which is indicated with the symbol !, leaving candidates b and c to tie as the optimal candidate. The symbol ☞ appears before candidate c because it is the actual output and it emerges as an optimal candidate. However, candidate b ties with candidate c for optimal candidate, so the symbol ☹ appears before candidate b.

(3) Tableau of constraint *COMPLEX

/floːɹ/	*COMPLEX
a. floːr	*!
b.☹fːor	
c.☞fi.loːr	

In the tableau above, the input, which is the Standard American English (SAE) pronunciation, is /floːɹ/. Although there are an infinite number of possible candidates, only three candidates are listed in order to illustrate how *COMPLEX works.

As mentioned earlier, this OT analysis does not attempt to account for featural change; however, theoretically CAH could account for the featural change from [ɹ] to [r]. Arabic does not contain the phoneme [ɹ], so according to CAH Arabic speakers would have difficulty pronouncing this phoneme. The Arabic counterpart to the English phoneme [ɹ] is [r], so the speakers negatively transfer this phoneme into their L2 English.

While candidate a is the most faithful, this faithfulness to the consonant cluster in the input causes it to violate *COMPLEX. Candidates b and c are less faithful to the input because candidate b deletes the second consonant of the cluster while candidate c uses epenthesis of [i] to break up the consonant cluster[4]. However, since this tableau only has the constraint *COMPLEX, their unfaithfulness does not affect their status as tying for the optimal candidate.

Once additional constraints are added to the tableau, the ranking of this constraint will determine how important it is for a language to avoid consonant clusters at syllable margins. It appears that in Cairene and Iraqi speakers' L2 English, this constraint must be ranked high because, while consonant clusters are found in the input, they are rarely found in the output. In Cairene Arabic, biconsonantal clusters are found word-finally, and biconsonantal word-initial clusters can be found in Iraqi Arabic[5].

3.2.2 MAX-IO Constraint

After establishing that both Iraqi Arabic and Cairene Arabic work to avoid complex syllable margins, the next consideration is *how* both dialects do this: they could delete a

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[4] The analysis in this paper does not attempt to account for featural change or features of the epenthetic vowel. For an analysis of featural change and features of the epenthetic vowel in Cairene Arabic, see Galal (2004). Galal states that [i] is cross-linguistically the default epenthetic vowel because its features are universally unmarked.
[5] This phenomena of only allowing a structure at a certain edge of the word is explained using extraprosodicity, where the edge of a prosodic word may not be subject to the same constraints as the rest of the prosodic word.

consonant in order to avoid complex syllable margins, like candidate b in (3), but the data

listed in (1) indicate that consonant deletion is not used to avoid complex syllable margins.

None of the speakers pronounce 'floor' as [fo:r]; similarly, 'three' is never pronounced [θri:]

(Broselow 1983, 1984). The avoidance of deletion indicates that a faithfulness constraint is

at work: MAX-IO is defined in (4) below.

(4) MAX-IO (McCarthy 1995)
     Input segments must have output segments; deletion is prohibited.

When MAX-IO is ranked high, a language will abstain from deleting segments from the input

in the output. As none of the data demonstrate deletion, MAX-IO must have a high ranking

for Cairene Arabic and Iraqi Arabic, which is illustrated in the tableau in (5).

(5) Cairene Tableau of 'floor' with ranking *COMPLEX, MAX-IO

/flo:ɹ/	*COMPLEX	MAX-IO
a. flo:r	*!	
b. f:or		*!
c.☞ fi.lo:r		

In (5) *COMPLEX and MAX-IO are ranked equally, indicated by the comma between

them rather than the symbol >>, and the output emerges as the optimal candidate. Thus, it

does not seem crucial to rank *COMPLEX above MAX-IO, Like the tableau in (3), the first

candidate is eliminated immediately because the word-initial consonant cluster violates

*COMPLEX. Because candidate a has been eliminated, the rest of its row is shaded.

Candidate b, which uses deletion to avoid violating *COMPLEX, is eliminated when it violates

MAX-IO. Here we can see the interaction between well-formedness constraints, such as

*COMPLEX, and faithfulness constraints, such as MAX-IO. In order to avoid a well-

formedness constraint, candidate b violates a faithfulness constraint, leaving candidate c as

the optimal candidate. However, candidate c is also violating a faithfulness constraint which doesn't appear in (5).

3.2.3 DEP-IO Constraint

The counterpart to the faithfulness constraint MAX-IO is DEP-IO, which stipulates that epenthesis, or insertion of a segment that is not in the input, should not occur. DEP-IO is defined in (6).

(6) DEP-IO (McCarthy 1995)
Output segments must have input correspondents; epenthesis must not occur.

When DEP-IO is clearly violated, as is the case with Cairene Arabic and Iraqi Arabic, it does not mean the constraint is not in the hierarchy; the constraint is ranked low in the hierarchy (see Section 3.2 for ranking of constraints). The tableau in (7) incorporates this constraint into the tableau from (5).

(7) Tableau of 'floor' with ranking *COMPLEX >> MAX-IO >> DEP-IO

/floːɹ/	*COMPLEX	MAX-IO	DEP-IO
a. floːr	*!		
b. fːor		*!	
c. ☞ fi.loːr			*

In (7) candidate c still wins despite the fact that it violates DEP-IO because, unlike the other two candidates, it does not violate the first or second-ranked constraint in the hierarchy.

This tableau further demonstrates the interaction between faithfulness and well-formedness constraints. Both DEP-IO and MAX-IO are faithfulness constraints; they aim to make the output as faithful as possible to the input. Faithfulness constraints such as MAX-IO and DEP-IO are at odds with well-formedness constraints such as *COMPLEX, which often require that the output not be entirely faithful to the input. Thus, all the candidates are bound either to violate well-formedness constraints for the sake of faithfulness, such as candidate a,

or to violate faithfulness constraints for the sake of well-formedness, as is the case with candidates b and c.

3.2.4 ONSET Constraint

Another commonly used well-formedness constraint that is especially important when analyzing the Iraqi Arabic data is ONSET, which is defined in (8) below.

(8) ONSET (Prince and Smolensky 1993)
All syllables must have an onset (a consonant must precede the nucleus of a syllable).

This constraint reflects Itô's (1984, 1989) Onset Principle, which was discussed in Chapter 2 (see Section 2.3.2). This constraint is motivated by the fact that syllables lacking onsets are universally marked; in Arabic syllables must have an onset, even if it requires additional epenthesis, which can be seen in the Iraqi form of 'floor,' [ʔifloːr]. A tableau that includes this constraint is presented in (9).

(9) Tableau of 'floor' with ranking ONSET, *COMPLEX, MAX-IO >> DEP-IO

/floːɹ/	ONSET	*COMPLEX	MAX-IO	DEP-IO
a. floːr		*!		
b. fːor			*!	
c. ☞ fi.loːr				*
d. if.loːr	*!			
e. ʔif.loːr				**!

In (9), candidates a, b, and d are eliminated first because they both violate one of the highest-ranked constraints (note that the broken line dividing the three columns indicates that these two constraints are ranked equally). Candidate a, the most faithful candidate, violates *COMPLEX because it has a consonant cluster in the onset of the syllable. Candidate b is eliminated because it violates MAX-IO by deleting a consonant in order to avoid violating

*COMPLEX. Candidate d is eliminated because it violates ONSET: Candidate d [if.lo:r] uses an epenthetic [i] that prevents it from violating *COMPLEX because the complex syllable margin [fl] is split so that [f] is a coda of the first syllable and [l] is the onset of the next syllable. However, the epenthesis of [i] causes a new syllable, [if], which lacks an onset, thus violating ONSET.

Thus, the only two candidates that haven't been eliminated are candidates c [fi.lo:r] and e [ʔif.lo:r]. Both candidates violate DEP-IO because they contain an epenthetic [i] that allowed them to avoid violating *COMPLEX; however, candidate e violates DEP-IO a second time because it begins with an epenthetic glottal stop that prevented it from violating ONSET. It is this second violation of DEP-IO that causes candidate e to be eliminated, leaving candidate c as the optimal candidate.

3.2.5 PEAK Constraint

While the current ranking of constraints causes the output to emerge as the optimal candidate, another constraint related to universal markedness in syllables should be added to explain the data once an additional output candidate is added. This additional candidate is *[f.lo:r] where [f] is syllabified as a separate syllable; thus, *COMPLEX is not violated, and neither are the faithfulness constraints.

(10) Tableau of Cairene 'floor'

/flo:ɹ/	ONSET	*COMPLEX	MAX-IO	DEP-IO
a. flo:r		*!		
b. f:or			*!	
c. fi.lo:r				*!
d. if.lo:r	*!			
e. ʔif.lo:r				**!
f.☺ f.lo:r				

In (10), candidate f emerges as the optimal candidate, although it is not the Cairene output. It does not violate any faithfulness constraints because it does not delete any segments from the input or use epenthesis. It does not violate ONSET because the [f] and [l] function as onsets for both syllables. Candidate f violates another important markedness constraint that is similar to ONSET in that is related to the minimal allowed syllable structure. This constraint, PEAK, is defined in (11) below.

 (11) PEAK (Archangeli 1997)
    Syllables must have a vowel.

Candidate f, *[f.lo:r] violates PEAK because the first syllable, [f], lacks a vowel nucleus. The Peak constraint is incorporated into the current hierarchy of constraints in (12).

 (12) Tableau of Cairene 'floor'

/flo:ɹ/	PEAK	ONSET	*COMPLEX	MAX-IO	DEP-IO
a. flo:r			*!		
b. f:or				*!	
c.☞ fi.lo:r					*
d. if.lo:r		*!			
e. ʔif.lo:r					**!
f. f.lo:r	*!				

The ranking in (12) includes the constraint PEAK as being ranked equally with the other markedness constraints ONSET and *COMPLEX and the faithfulness constraint Max-io. While the current hierarchy causes the optimal candidate to emerge for the English word 'floor,' which contains a word-initial biconsonantal cluster, it is insufficient when analyzing a form containing a word-medial triconsonantal cluster, such as 'children.' A tableau for the Cairene pronunciation of 'children' is shown in (13) to illustrate the need for additional constraints.

(13) Tableau of Cairene 'children'

/ʧɪl.dɹɛn/	PEAK	ONSET	*COMPLEX	MAX-IO	DEP-IO
a. ʧil.dren			*!		
b. ʧild.ren			*!		
c. ʧil.id.ren		*!			*
d.⊗ʧi.lid.ren					*
e.☞ʧil.di.ren					*
f. ʧil.den				*!	
g. ʧil.d.ren	*!				

In (13), candidates d and e tie for optimal candidate because neither of them violates any of the top-ranked constraints, and both candidates have a single violation of DEP-IO. The difference between these two candidates is where the epenthetic [i] is inserted; in candidate d, which is actually the Iraqi output for 'children,' epenthesis occurs before the second consonant in the cluster, while in candidate e, the Cairene output, epenthesis occurs after the second consonant in the cluster. The necessary constraint for the optimal candidate to emerge is another markedness constraint; however, unlike the three markedness constraints on the tableau so far, this constraint deals with sonority.

3.2.6 SYLLABLE CONTACT Constraint

Although this constraint is not pivotal in determining the optimal candidate in monosyllabic forms such as 'floor,' it seems to be necessary for the optimal candidate to emerge in the Cairene pronunciation of 'children,' and Galal (2004) illustrated its necessity in tableaux for English loanwords in Cairene. The concept of Syllable Contact relies on sonority, particularly the sonority scale, which is illustrated in (14).

(14) Sonority Scale

Most sonorous
vowels
glides
liquids
nasals
fricatives
stops
Least sonorous

According to the Sonority Scale, vowels are the most sonorous, followed by glides such as

[w] and [j]. Just below glides are liquids, such as [l] and [r], which are followed by nasals.

Near the bottom of the scale are fricatives, such as [s]; and stops, such as [t] and [b], are the

least sonorous. Syllable contact maintains that sonority cannot rise across syllable

boundaries. While this concept existed long before OT, it can be used as a constraint, as

Gouskova (2002) points out. The constraint SYLLABLE CONTACT is defined in (15).

(15) SYLLABLE CONTACT (Gouskova 2002)
        Sonority cannot rise across syllable boundaries.

Syllable Contact prohibits the coda of one syllable from having a lower sonority level than

the onset of the syllable following it. In (16) this constraint is shown in a tableau with output

candidates for 'children.' In tableaux, SYLLABLE CONTACT will be written as σCONTACT.

(16) Tableau of 'children' with ranking PEAK, ONSET, *COMPLEX, MAX-IO,
SYLLABLE CONTACT >> DEP-IO

/tʃɪl.dɹɛn/	PEAK	ONSET	*COMPLEX	MAX-IO	σCONTACT	DEP-IO
a. tʃil.dren			*!			
b. tʃild.ren			*!		*	
c. tʃil.id.ren		*!			*	*
d. tʃi.lid.ren					*!	*
e.☞ tʃil.di.ren						*
f. tʃil.den				*!		
g. tʃil.d.ren	*!				*	

In (16), candidates b, c, d, and g violate SYLLABLE CONTACT because a [d] in the coda position is followed by an [r] in the onset position of the following syllable. A [d] is a stop, which is located at the bottom of the sonority scale, while [r] is a liquid, which is located relatively high on the sonority scale. Thus, the [d] coda followed by the [r] onset sonority to rise across the syllable boundary, which is a violation of SYLLABLE CONTACT. There is no evidence to indicate that this constraint is ranked lower than the other markedness constraints; thus, SYLLABLE CONTACT joins the top-ranked constraints and causes candidate d, which previously tied with candidate e for optimal candidate e, to be immediately eliminated.

Thus, the final ranking of constraints for Cairene Arabic speakers' L2 English seems to be PEAK, ONSET, *COMPLEX, MAX-IO, SYLLABLE CONTACT >> DEP-IO. In order to examine why Iraqi speakers have a different output than the Cairene speakers for English forms containing a word-initial biconsonantal cluster or word-medial triconsonantal cluster, in the next section one of these constraints will be altered so that the Iraqi output emerges as the optimal candidate.

3.3 Iraqi Ranking of Constraints

As the tableau in (16) illustrates, the ranking of constraints for Cairene speakers' L2 English prevents the Iraqi output for children, [tʃi.lid.ren] from emerging as the optimal candidate. In this section I propose that the SYLLABLE CONTACT constraint should be altered in order for the Iraqi output to emerge as the optimal candidate.

The current SYLLABLE CONTACT constraint prohibits sonority from rising across syllable boundaries. However, there could be a counterpart to this constraint that prohibits sonority from falling across syllable boundaries. For instance, Section 3.2 accounted for the

Cairene output being [tʃil.di.ren], not *[tʃi.lid.ren] because the sonority rises from the [d] in

[lid] to the [r] in [ren]. However, if the Syllable Contact constraint prohibits sonority from

falling across syllable boundaries, then the form *[tʃi.lid.ren] is preferable because the

sonority does not fall across the syllable boundary between [d] and [r].

3.3.1 Altered SYLLABLE CONTACT constraint

In order to provide an OT account for the different site of epenthesis in Iraqi

speakers' L2 English, the SYLLABLE CONTACT constraint should be split into two separate

constraints: one that prohibits sonority from rising across syllable boundaries and one that

prohibits sonority from falling across syllable boundaries. I propose altering this constraint

to the two constraints shown in (20).

(20) SYLLABLE CONTACT Constraint Split into 2 Constraints

      a. SYLLABLE CONTACT^{*RISE}
          Sonority should not rise across syllable boundaries.
      b. SYLLABLE CONTACT^{*FALL}
          Sonority should not fall across syllable boundaries.

Since Syllable Contact has been used to account for data in many languages where sonority

rising across syllable boundaries is prohibited (Davis 1998, Gouskova 2002, Hooper 1976,

Murray and Vennemann 1983, Vennemann 1988, cited in Galal 2004), it seems that sonority

rising across syllable boundaries is cross-linguistically more marked than sonority falling

across syllable boundaries. Thus, the SYLLABLE CONTACT^{*FALL} constraint is ranked so low

cross-linguistically that it is not usually relevant in the emergence of the optimal candidate.

However, the L2 syllable errors produced by Iraqi speakers seem to support the need for

SYLLABLE CONTACT^{*FALL} being ranked above SYLLABLE CONTACT^{*RISE}. The Cairene form

[tʃil.di.ren] violates SYLLABLE CONTACT^{*FALL} twice because the sonority must fall across the

syllable boundary between [tʃil] and [di], as well as the boundary between [di] and [ren]. The

Iraqi form [tʃi.lid.ren] only violates SYLLABLE CONTACT[*FALL] once because the sonority falls

across the syllable boundary between [di] and [ren].

Now that SYLLABLE CONTACT has been altered, the Iraqi output for 'floor' and

'children' can be evaluated in tableaux. In (21) below the tableau for the Iraqi pronunciation

of 'children' is presented.

(21) Tableau of Iraqi 'children' with ranking PEAK, ONSET, *COMPLEX, MAX-IO,

SYLLABLE CONTACT[*FALL] >> DEP-IO

/tʃɪl.dɹɛn/	PEAK	ONSET	*COMPLEX	MAX-IO	σCONT[*FALL]	DEP-IO
a. tʃil.dren			*		*!	
b. tʃild.ren			*!			
c.☹tʃil.id.ren		*				*
d.☞tʃi.lid.ren					*	*
e. tʃil.di.ren					**!	*
f. tʃil.den				*	*!	
g. tʃil.d.ren	*				*!	

The current ranking of constraints causes candidate c to tie with candidate d, the actual

output. However, if the ranking is altered so that SYLLABLE CONTACT[*FALL] is ranked below

the top-ranked constraints, the output emerges as the optimal candidate. This re-ranking is

illustrated in (22).

(22) Tableau of Iraqi 'children' with ranking PEAK, ONSET, *COMPLEX, MAX-IO >>

          SYLLABLE CONTACT^{*FALL} >> DEP-IO

/tʃɪl.dɹɛn/	PEAK	ONSET	*COMPLEX	MAX-IO	σCONT^{*FALL}	DEP-IO
a. tʃil.dren			*!		*	
b. tʃild.ren			*!			
c. tʃil.id.ren		*!				*
d. ☞ tʃi.lid.ren					*	*
e. tʃil.di.ren					**!	*
f. tʃil.den				*!	*	
g. tʃil.d.ren	*!				*	

With this altered ranking of constraints, the Iraqi output of 'children' emerges as the optimal

candidate. However, the output would emerge as the optimal candidate if were ranked

equally with DEP-IO. In order to determine if must be ranked above DEP-IO when evaluating

forms with a word-initial biconsonantal cluster, the Iraqi pronunciation of 'floor' is evaluated

in the tableau in (23).

(23) Tableau of Iraqi 'floor'

/flo:ɹ/	PEAK	ONSET	*COMPLEX	MAX-IO	σCONT^{*FALL}	DEP-IO
a. flo:r			*!			
b. f:or				*!		
c. fi.lo:r					*!	*
d. if.lo:r		*!				*
e. ☞ ʔif.lo:r						**
f. f.lo:r	*!					

As (23) illustrates, SYLLABLE CONTACT^{*FALL} must be ranked above DEP-IO rather than equal

to it. If these two constraints were ranked equally, candidate c would tie with the output as

the optimal candidate because they would both have a total of two violations of the bottom

two constraints. Thus, the ranking of constraints for these Iraqi speakers' L2 English is

PEAK, ONSET, *COMPLEX, MAX-IO >> SYLLABLE CONTACT^{*FALL} >> DEP-IO.

<div align="center">3.4 <u>Alternative Analysis</u></div>

Mester and Padgett (1994) propose an alignment constraint that incorporates Itô's

(1986, 1989) directional templatic syllabification, which Galal (2004) uses to provide a

transfer-based account for Cairene Arabic speakers' L2 English syllable errors. Mester and

Padgett's alignment constraint, which relies heavily on moras, is shown in (22) below.

    (24)   SYLL-ALIGN (Syll, Edge, PrWd, Edge) (Mester and Padgett 1994)
             Every syllable must be aligned with the edge of some prosodic word.

SYLL-ALIGN is a gradient constraint, and when a syllable is not aligned with the edge of

some prosodic word, its misalignment from the edge is counted in moras. SYLL-ALIGN is

violated for each mora between the syllable and the edge of the Prosodic Word. In Iraqi, all

syllables are evaluated on their alignment with the left edge of the prosodic word, while in

Cairene all syllables are evaluated on their alignment with the right edge of the prosodic

word, which accounts for the different site of epenthesis in Iraqi versus Cairene Arabic.

Rather than use actual input and output forms, Mester and Padgett illustrate their constraint

with only the syllable skeleton. Their application of SYLL-ALIGN(L) is illustrated in the

tableau in (25).

(25)   Tableau with SYLL-ALIGN(L) (Mester and Padgett 1994)

	Syll-Align(L)			
/cvcccv/	S1	S2	S3	S4
a.☞ cv.cVc.cv		m	mmm	
b. cvc.cV.cv		mm	mmm!	
c. cv.cV.cV.cv		m	mm	mm(!)m

In (25), the distance between the syllable and the left edge of the Prosodic Word is measured

in moras, which are represented on the tableau with the letter m. As it is impossible for a

polysyllabic word to avoid violating this constraint, SYLL-ALIGN(L) is a gradient constraint:

a violation is incurred for every mora that a syllable is away from the left edge of the word.

Bounteous violations of this constraint are inevitable, so in (25) the optimal candidate still

violates the constraint four times. However, candidates b and c both violate the constraint

more than four times.

When this constraint is used to explain Cairene and Iraqi speakers' L2 English

syllables, the assumption that transfer from their L1 is the cause of the syllable errors is

inherent in the analysis. Mester and Padgett (1994) proposed SYLL-ALIGN(L) in order to

make templatic syllabification (Itô 1986, 1989) into an OT constraint. Rather than using a

constraint that assumes transfer of syllabification from L1 to L2 as Galal (2004) did, the

explanation provided in this chapter supports an approach that favors markedness as the

reason for Cairene and Iraqi speakers' pronunciation rather than transfer. In this chapter, the

goal was to illustrate how Cairene and Iraqi pronunciations of English consonant clusters

may be due to the interaction of markedness and well-formedness constraints in their interlanguage rather than transfer.

Further research where L2 English syllables pronounced by speakers of various native languages are analyzed in OT tableaux should be done in order to compare the hierarchy of constraints in L2 English speakers' interlanguage. If L2 English speakers cross-linguistically have a similar hierarchy of markedness and faithfulness constraints, MDH rather than CAH would receive more support as the explanation for syllable errors. However, it is beyond the scope of this thesis to do a cross-linguistic comparison of errors in L2 English syllables.

3.5 Conclusion

Native speakers of Cairene and Iraqi Arabic pronounce English words containing consonant clusters in a non-native fashion because they use epenthesis in order to break up these consonant clusters, while native English speakers do not. It has been suggested (Broselow 1983, 1984, 1988 and Galal 2004) that Cairene and Iraqi speakers who use epenthesis to break up consonant clusters in their L2 English are transferring the syllable structure and direction of syllable mapping from their native language into English. Both the Contrastive Analysis Hypothesis and the Markedness Differential Hypothesis could predict these errors. Since syllables with consonant clusters are not allowed in their native dialect, CAH would predict that Cairene and Iraqi speakers of L2 English would produce errors when they encounter English syllables with consonant clusters. The Markedness Differential Hypothesis would consider the level of markedness of the L2 structures, which in this case are complex syllable margins. Since complex syllable margins are universally more marked

than simple syllable margins, the Markedness Differential Hypothesis would also predict that Cairene and Iraqi speakers would produce errors when pronouncing English words that have complex syllable margins.

While both Cairene and Iraqi speakers use epenthesis to break up consonant clusters in English, the site of epenthesis is different. While Itô (1986, 1989) argued that the reason for the different pronunciations of consonant clusters in Cairene and Iraqi dialects can be attributed to the fact that Cairene maps the syllable template from left to right while Iraqi maps it from right to left, it must be noted that Itô was not attempting to explain epenthesis and syllable structure errors in Cairene and Iraqi speakers' L2 English. The OT analysis presented in this chapter illustrates that an interaction between markedness constraints and faithfulness constraints, rather than transfer of syllabification rules from the native language, could account for Cairene and Iraqi speakers' use of epenthesis in L2 English.

Further research is necessary to analyze Cairene pronunciations of English words that begin with sibilant + stop + liquid because these forms do not conform to the ranking of constraints proposed in this chapter. Rather than spend more time analyzing these forms, this thesis moves on to discuss how native speakers of Najdi Arabic deal with consonant clusters when speaking L2 English. Najdi Arabic is a good Arabic dialect to examine when exploring the influence of transfer on L2 syllables because, unlike Cairene and Iraqi Arabic, Najdi Arabic allows more complex syllable structures, making it more similar to English in that aspect. Since both word-initial biconsonantal and word-medial triconsonantal clusters are allowed in this dialect, if syllable errors are due to speakers transferring allowed syllable structures from their L1 to their L2, then Najdi Arabic speakers should not produce syllable errors when faced with English consonant clusters.

CHAPTER 4: NAJDI ARABIC

4.0 Introduction

While a plethora of phonological papers have been written about Cairene and Iraqi

Arabic (Aquil 2006, Broselow 1976, 1980, 1983, 1984, 1988, Galal 2004, Itô 1986, 1989,

Selkirk 1980), many other Arabic dialects have been largely underrepresented in the field of

phonology. One such dialect is the Najdi dialect, which is spoken in Central Saudi Arabia,

including Riyadh, the capital of Saudi Arabia (Omar 1975). Abboud, (1979), in his

discussion of Najdi verbs, mentions how few linguistic papers have focused on this dialect.

While he made this statement in 1979, almost thirty years later I was still unable to find other

studies focused on the phonology of Najdi Arabic.

Najdi Arabic is very unique among Arabic dialects because it has retained more

features from ancient Arabic dialects than other modern-day dialects of Arabic (Abboud

1979). It is also noteworthy because it is the dialect of the royal family in Saudi Arabia

(Omar 1975). A phonological feature that makes this Arabic dialect unique is its frequently

occurring consonant clusters (Abboud 1979). This chapter explores how Najdi speakers deal

with consonant clusters and syllabification in their native language; Section 4.1 describes

syllable structures that are allowed in the Najdi Arabic dialect, while Section 4.2 discusses

the role of Syllable Contact in Najdi syllabification. Section 4.3 concludes this chapter and

makes two hypotheses based on MDH about syllabification in Najdi speakers' L2 English.

4.1 Najdi Syllable Structures

One great difference between Najdi Arabic and other Arabic dialects is the maximal

syllable structure. Like Iraqi Arabic, in Najdi a biconsonantal onset is allowed word-

initially; other than in the word-initial position, complex onsets are prohibited. Also like

Cairene and Iraqi Arabic, Najdi Arabic syllables allow but do not require a coda. While

Cairene Arabic allows a complex coda in the word-final position, in Najdi a biconsonantal

cluster is allowed in the coda position regardless of the position of the syllable in the word

(Abboud 1979). In (1) are some examples of acceptable forms in Najdi Arabic.

(1) Syllable Structures in Najdi Arabic (Abboud 1979)
    a. Word-initial CC, no coda: [nxa.dim] ➔ CCV.CVC
    b. Word-initial CC, coda: [txad.mīn] ➔ CCVC.CVC
    c. Word-initial CC, complex coda: [tbart.līn] ➔ CCVCC.CVC
    d. No word-initial CC, no coda: [ki.tal] ➔ CV.CVC
    e. Word-medial complex coda: [mti.bart.līn] ➔
       CCV.CVCC.CVC
    f. No word-final coda: [zir.na] ➔ CVC.CV

Abboud (1979) describes syllable boundaries as highly predictable in Najdi Arabic. When a

consonant can be syllabified either as a coda or as an onset of the following syllable, the

consonant will always be syllabified in the onset position. In the case of a word-medial

biconsonantal cluster, the syllable boundary falls between the two consonants, causing the

first consonant to be a simple coda and the second consonant to be a simple onset. In word-

medial triconsonantal clusters, the syllable boundary is between the second and third syllable,

showing Najdi Arabic's preference for complex codas over complex onsets. These principles

in syllabification are shown in (2). Syllable boundaries are marked with a period.

(2) Syllable Boundary Assignment in Najdi Arabic (Abboud 1979)

    a. VCV ➔ V.CV

    b. VCCV ➔ VC.CV

    c. VCCCV ➔ VCC.CV

<div align="center">4.2 SYLLABLE CONTACT and Najdi Syllabification</div>

As (2) illustrated, in Najdi Arabic the most important factor in syllabifying word-medial triconsonantal clusters is coda-maximization rather than a sonority constraint. Forms presented by Abboud (1979) to illustrate syllabification support this hypothesis. Example forms that illustrate the insignificance of Syllable Contact in Najdi are presented in (3).

(3) Examples of Syllabification in Najdi (Abboud 1979)

Structure	Initial (CC-)	Initial	Medial	Final
CV	a. nxa.dim (*falling*)	e. ki.tal (*falling*)	i. yis.ti.ʃir (*falling*)	m. zir.na (*falling*)
CVC	b. txad.mīn (*rising*)	f. ʃar.ban (*falling*)	j. ʃaː.fat.ham (*falling, rising*)	n. ʃaː.fat.kam (*falling*)
CVCC	c. tlabb.sīn (*rising*) d. tbart.līn (*rising*)	g. lab.si (*rising*) h. bart.li (*rising*)	k. mti.labb.sīn (*falling, rising*) l. mti.bart.līn (*falling, rising*)	o. ʔiħ.ti.gart (*falling, falling*)

As can be seen in (3), Najdi contains forms that violate SYLLABLE CONTACT*RISE and SYLLABLE CONTACT*FALL. Of the 19 instances where sonority either rises or falls across syllable boundaries, the sonority falls in ten instances and rises in nine; thus, from the data Abboud (1979) provided, it seems that both SYLLABLE CONTACT*RISE and SYLLABLE CONTACT*FALL are not top-ranked constraints, and they may even be ranked equally.

Because of the relatively low ranking of both SYLLABLE CONTACT constraints, it is more difficult to determine which one is ranked higher. As SYLLABLE CONTACT*RISE seems to be ranked higher cross-linguistically, it could be assumed Najdi uses the ranks SYLLABLE

CONTACT^{*RISE} higher than SYLLABLE CONTACT^{*FALL} since it is cross-linguistically more common. However, it must be noted that the data given do not necessarily support SYLLABLE CONTACT^{*RISE} being ranked above SYLLABLE CONTACT^{*FALL}.

4.3 Conclusion and Predictions

Unlike Cairene and Iraqi Arabic, Najdi Arabic allows word-medial complex syllable margins as well as complex syllable margins on word edges. Since this dialect's syllabification is closer to English than Cairene and Iraqi Arabic, CAH would predict that these speakers will have less difficulty with English consonant clusters and thus should not use epenthesis to break up word-initial biconsonantal clusters or word-medial triconsonantal clusters because in Najdi both of these structures are allowed.

However, Tarone's (1980) study found that speakers of a L1 Korean, which allows more complex syllables, like Najdi, had approximately the same rate of error with L2 English complex syllable margins as speakers of L1s that do not allow complex syllable margins, which goes against predictions made by CAH. CAH would predict that the L1 Korean speakers would have had a lower rate of syllable errors because their L1 allows complex syllables. However, this CAH prediction does not match the results of Tarone's (1980) study where the Korean speakers had a similar rate of error for syllable production as the speakers whose L1s did not allow complex syllables.

Not only do Tarone's (1980) results suggest that transfer is not the key factor in L2 syllable errors, they also support a stronger version of MDH. The traditional MDH (Eckman 1977) would also predict that the Korean speakers would have less difficulty with complex syllable margins in their L2 English because they have those structures in their L1; thus, in the traditional version of MDH markedness becomes a key factor only if the structure in the

L2 is different from the structure in the L1. However, the Korean speakers' rate of error with

English syllable production seems to suggest that markedness is an important factor in the

difficulty L2 learners will have with a structure, *even if* that structure exists in the speakers'

L1. Thus, the results of Tarone's (1980) study support a stronger version of MDH that

predicts that L2 speakers will have difficulty acquiring structures that are marked, regardless

of whether those structures appear in the speakers' L1.

When the results of Tarone's (1980) study are considered, two hypotheses regarding

Najdi Arabic speakers' L2 English could be made using her proposed stronger version of

MDH. These hypotheses are listed below.

(4) Hypotheses for Najdi L2 English syllable structure

    a. The learners should have less difficulty with English word-initial
       biconsonantal clusters because English word-initial biconsonantal clusters are
       less marked than Najdi word-initial biconsonantal clusters when the
       Sonorancy Sequencing Principle (Clements 1990) is considered; thus, the
       Najdi speakers are moving from a more marked word-initial biconsonantal
       clusters that do not necessarily conform to SSP in their L1 to less marked
       word-initial biconsonantal clusters in their L2 English which abide by SSP.

    b. Word-medial triconsonantal clusters are more marked than word-edge
       biconsonantal clusters, so Najdi speakers may have more difficulty with
       English words containing word-medial triconsonantal clusters than word-edge
       biconsonantal clusters, even though word-medial triconsonantal clusters exist
       in the speakers' L1.

Hypothesis (4a) relies on the Sonorancy Sequencing Principle (SSP), which stipulates that

complex onsets must rise in sonority, and complex codas must fall in sonority (Clements

1990). English word-initial biconsonantal clusters obey this principle: the sonority of the

first consonant in the cluster is lower than the second consonant in the cluster (**fr**iend, **tr**ee,

plane, **sl**am, **pr**y). Najdi Arabic forms often disobey SSP, which can be seen in forms (3a),

(3k), and (3l) where the sonorancy lowers from the first consonant to the second consonant in

the cluster. Thus, the word-initial biconsonantal clusters in English are less marked than the word-initial biconsonantal clusters in Najdi Arabic; since the Najdi speakers are moving from a more marked structure in their L1 to a less marked structure in their L2 English, they should not experience difficulty with the English word-initial biconsonantal clusters.

Since Najdi contains both word-initial biconsonantal clusters and word-medial triconsonantal clusters, CAH would predict that the speakers should not have difficulty with either form in their L2 English. However, if the markedness of both structures is considered, the prediction in (4b) can be made that the speakers will experience greater difficulty with word-medial triconsonantal clusters than they do with word-initial biconsonantal clusters because word-initial biconsonantal clusters are less marked than word-medial triconsonantal clusters. Cross-linguistically, many languages that allow word-edge clusters do not allow word-medial clusters; however, all languages that have word-medial clusters also have word-edge clusters, making word-medial clusters universally more marked than word-edge clusters.

This chapter and Chapter 5 only deal with word-initial biconsonantal clusters and word-medial triconsonantal clusters because it was not within the scope of this thesis to deal with the vast array of possible consonant clusters. Further research should address other consonant clusters, such as how Najdi speakers deal with word-medial quadriconsonantal clusters and word-initial triconsonantal clusters. The purpose of this chapter was merely to briefly examine word-initial biconsonantal and word-medial triconsonantal clusters in order to apply this knowledge to Najdi speakers' pronunciations of L2 English words containing word-initial biconsonantal and word-medial triconsonantal clusters.

CHAPTER 5: NAJDI ARABIC SPEAKERS' L2 ENGLISH

5.0 <u>Introduction</u>

In order to apply the constraints discussed in Chapter 3 to different Arabic speakers of English and determine if the two hypotheses proposed at the end of Chapter 4 are correct, a project to collect phonological data from Saudi students at the University of Montana was created. This chapter describes L2 English data from native speakers of the Najdi Arabic dialect in central Saudi Arabia. Section 5.1 describes the data collection while Section 5.2 presents the results of the data. Section 5.3 is a discussion of the data, and Section 5.4 analyzes certain forms in OT tableaux. Section 5.5 concludes the chapter and proposes future research.

5.1 <u>Data Collection</u>

In order to analyze how Arabic speakers of a different dialect deal with consonant clusters in their L2 English, data had to be collected because I was unable to find previously published data that focused on this. Saudi Arabians who attend the University of Montana were interviewed and asked to read sentences that contained consonant clusters in order to obtain data of how these speakers pronounce English words containing consonant clusters. The data were not statistically analyzed because the purpose of the study was simply to obtain attested pronunciations from these speakers, not to do a statistical analysis of how often these speakers produce errors when pronouncing English words with consonant clusters. Both Broselow (1983, 1984) and Galal (2004) present L2 forms that they collected without any statistical analysis; following their lead, I focus on the forms I collected and how OT can account for these forms rather than a statistical analysis of the forms.

5.1.1 <u>Subjects</u>

All twenty-two subjects were Saudi Arabian men who, at the time of data collection, were studying at the University of Montana. The subjects had been living in the United States for anywhere from three to twenty-two months. While three of the subjects have been fully matriculated into the University of Montana, the other nineteen subjects were studying at the English Language Institute at the University of Montana in order to improve their English before being matriculated into college classes at the University of Montana.

Of the twenty-two subjects involved, fourteen were from the Najdi area of Saudi Arabia, which includes the capital Riyadh and central Saudi Arabia. The other eight subjects were from Eastern, Western, or Southern Saudi Arabia, where different dialects of Arabic are spoken.

5.1.2 Procedure

Subjects were interviewed individually, in an office, and the interview was recorded with a digital audio recorder. Each subject was first asked a set of questions to determine which dialect he spoke and a general idea of his proficiency in English. These questions are listed in (1).

(1) Initial questions the Saudi students were asked
   a. Where are you from in Saudi Arabia?
   b. How long have you been living in the United States?
   c. Do you attend the English Language Institute?
   d. If yes, what level classes are you in?
   e. If no, what ESL classes are you currently taking at the University of Montana?

Question (1a) was used to determine which dialect the subject spoke. The first three students were asked which dialect they spoke, but they were unable to answer this question; when they were unable to answer this question, I asked them question 1a, and in the following interviews the subjects were not asked which dialect they spoke.

After these initial questions, each subject was asked a question about Saudi Arabian

culture in order to obtain naturalistic linguistic data. The most frequently asked questions

about Saudi culture are listed in (2) below.

> (2) Questions asked about Saudi culture
>> a.   What holidays do you celebrate in Saudi Arabia?
>> b.   What do you do for fun in Saudi Arabia?
>> c.   What is the process for getting married in Saudi Arabia?
>> d.   How do families function in Saudi Arabia?
>> e.   What television shows are popular in Saudi Arabia?

Sometimes an additional question was asked to elaborate on the culture question if the

subject provided a very short response to the initial culture question. After the subject had

answered the question (answers varied in time from two to five minutes), he was asked to

read ten sentences (see Appendix I for the list of sentences). The sentences were constructed

to include different types of consonant clusters, which are illustrated in the table in (3).

> (3) Consonant clusters in the ten sentences

Type of Consonant Cluster	Position of CC in word	Examples from sentences (consonant cluster in bold)
biconsonantal cluster	word-initial	**fr**om, **Sp**ain, **pr**efer, **thr**ee, **sw**eater, **tr**oop, **br**ain, **gr**oceries, **sk**ate, **sk**ip, **cl**ass
biconsonantal cluster	word-medial	dis**l**ikes, con**s**is**t**ently
biconsonantal cluster	word-final	sa**cks**, wea**rs**, nee**ds**
biconsonantal clusters	multiple	**sk**irt, **pl**as**t**ic, **bl**ack**l**isted, pu**bl**icly
triconsonantal cluster	word-initial	**str**ikes, **str**eet
triconsonantal cluster	word-medial	chi**ldr**en
triconsonantal cluster	word-final	wa**nts**
bi and triconsonantal clusters	multiple	con**s**is**t**ently, **tr**an**sl**ating
quadriconsonantal cluster	word-medial	tra**nspl**ant, tra**nscr**ipt

Having the subjects read the sentences in addition to answering a question about Saudi

culture ensured that every subject would produce forms containing consonant clusters. The

disadvantage to relying on how subjects pronounced forms that they read is it is often not

representative of their natural speaking. In fact, many subjects mentioned after the interview

their awareness of the fact that their pronunciation is far better when they are speaking

naturally than when they are reading out loud. Once the subject had finished reading the ten

sentences, the audio recorder was turned off.

5.2 <u>Results</u>

Since the majority of the subjects were from Riyadh or its vicinity, this thesis only

focuses on the dialect spoken in Riyadh, which is Najdi Arabic (Omar 1975). Most of the

words containing complex syllable margins that were recorded began with a biconsonantal

cluster. The most frequently-occurring word that was elicited naturally (not from reading the

sentences) was 'from' because most subjects used the word when answering the question 1a,

"Where are you from in Saudi Arabia?" Unlike the pronunciations of 'floor' explored in

Chapter 3, the native Najdi Arabic speakers did not use epenthesis or deletion to avoid the

biconsonantal cluster. Of the twelve instances where Najdi subjects naturally produced the

word 'from,' there was not a single instance of epenthesis or deletion used to break up the

word-initial biconsonantal cluster [fɹ].

Similarly, the Najdi Arabic subjects did not use epenthesis or deletion when naturally

pronouncing words containing a word-final biconsonantal cluster, which is exhibited in (4).

The Najdi pronunciation is compared to the Standard American English (SAE)

pronunciation.

(4) Naturally produced words with a word-final biconsonantal cluster

Word	SAE Pronunciation	Najdi Pronunciation	% Accuracy
'six'	[sɪks]	[siks]	100%
'want'	[want]	[want]	100%
'second'	[sɛkənd]	[sekand]	100%
'month'	[mənθ]	[mənθ]	100%

As was the case with the word-initial biconsonantal cluster where the subjects were able to

produce the consonant cluster with 100% accuracy in terms of syllabification, these Najdi

speakers naturally produced words containing word-final biconsonantal clusters with 0%

error. Featural changes, such as [ɪ] being pronounced as [i], were not taken into account

when determining the percent of accuracy.

Although the data obtained naturally (not from reading aloud) showed no use of

epenthesis to break up word-initial or word-final biconsonantal clusters, subjects did use

epenthesis when dealing with a word-medial triconsonantal cluster, which was evidenced in

their reading of 'children' and 'translating,' as well as naturally-produced pronunciation of

'apartment.' However, in the two instances where 'complete' was produced naturalistically,

no epenthesis occurred; similarly, in a recorded instance of the natural production of

'central,' there was no epenthesis. The Najdi Arabic pronunciations of 'children,'

'apartment,' 'central,' and 'complete' are provided in (5). Epenthetic segments appear in

bold.

(5) Pronunciations of word-medial triconsonantal clusters

Word	SAE Pronunciation	Najdi Pronunciation	% Accuracy
a. 'children'	[t͡ʃɪl.drən]	[t͡ʃil.də.ren], [t͡ʃil.dren]	39%
b. 'apartment'	[ʔə.par.ʔmənt]	[ʔəpar.t✋.mɛnt]	0%
c. 'translating'	[tɹæn.zletiŋ]	[tɹan.s✋.le.tiŋ], [tɹan.zə.le.tiŋ], [tɹan.zletiŋ]	17%
d. 'central'	[sɛn.tɹəl]	[sen.tral]	100%
e. 'complete'	[kəm.pliʔ]	[kəm.blit]	100%

In (5), the symbol ✋ represents a pause, which is discussed more in-depth later in this chapter. It is worth noting that examples (5a) and (5c) came from the subjects' reading, while examples (5b), (5d), and (5e) came from their natural speech. Unlike Broselow (1983, 1984, 1988) and Galal's (2004) studies, which do not note that some non-native speakers do syllabify and avoid epenthesis in a more nativelike fashion, the table in (5) illustrates that pronunciations vary from speaker to speaker, even within native speakers of the same dialect. As interlanguage systems usually exhibit a high degree of variability, even within the same subject's productions, it was be expected that various pronunciations of the same word would be recorded. It should also be noted that the examples in (5d) and (5e) come from a single speaker, which is most likely why the accuracy rate is 100%. Had many speakers used the words 'central' and 'complete,' due to the high rate of variability in interlanguage systems, there would have been a greater chance for a lower rate of accuracy.

5.3 Discussion

The results from the Najdi data collection are largely different from the pronunciations elicited from Cairene and Iraqi speakers (see Chapters 2 and 3) because the subjects naturalistically produced English words beginning with a biconsonantal cluster with

very high accuracy. However, in the Najdi speakers' reading of words containing triconsonantal clusters, epenthesis was often utilized, which can be seen in the table in (5). Unfortunately, because neither Broselow nor Galal discuss how frequently epenthesis was used to break up consonant clusters for Cairene and Iraqi speakers, the rates of accuracy that Najdi speakers demonstrated when producing forms containing word-medial triconsonantal clusters cannot be compared to accuracy rates in Cairene and Iraqi speakers. I suggest that future research compare the rate of accuracy with English syllables produced by L1 speakers of Cairene Arabic, Iraqi Arabic, and Najdi Arabic to determine if Najdi speakers of L2 English do produce less syllable errors overall.

The Najdi dialect has received less attention than other dialects of Arabic (Abboud 1979), so there are few studies regarding Najdi with which the data collected in this experiment can be compared. However, Dabaan (1983) did a study on error analysis when teaching English pronunciation to Saudi high school students, and one of the high schools included in his study is located in the Najdi region of Saudi Arabia. Some of Dabaan's findings regarding errors in syllable structure are presented in (6). Note that Dabaan defined syllable errors as when a consonant or vowel is deleted or inserted, not when a featural change, such as /p/ being pronounced as [b], occurs. Thus, Dabaan evaluated syllable errors in the same fashion that accuracy was determined in (5).

(6) Syllable Error Frequency of Al-Yamamah Saudi students (Dabaan 1983)

Syllable Structure	Example	Average % Error
CVC	'for'	3%
CCVC	'from'	3.3%
CVCC	'want'	18.3%

In my study, speakers naturalistically produced word-initial CCVC syllables with 100% accuracy[6]; likewise, the speakers in Dabaan's (1983) study only had an average error rate of 3.3% for the syllable structure CCVC. Similarly, subjects in my study usually produced words ending with the CVCC structure, such as the forms in (4), without syllable errors; the average rate of error for this structure in Dabaan's study is 18.3%, which is considerably higher than the CCVC form but still low when compared to the rate of error for syllables containing triconsonantal clusters.

It is difficult to compare the results of my study with Dabaan's more than superficially because the purpose and reporting of Dabaan's study is vastly different; since Dabaan was not gathering phonological data for an OT analysis, he did not need to consider constraints such as syllable contact, which can be used to motivate epenthesis in consonant clusters depending on the consonants involved. Moreover, Dabaan's study did not explore the relationship between the rate of error for a syllable structure and where the syllable occurred in the word. For instance, in my study the subjects seemed to have little difficulty producing the syllable structure CVCC in monosyllabic words such as 'want' and 'month,'

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[6] Only naturalistically produced forms—not forms that were read aloud—were considered when determining the accuracy rate of CCVC syllables. An effort was made to use the less natural data from the sentence reading activity only when necessary. There were enough instances of word-initial biconsonantal clusters being produced naturally that the less natural data was deemed unnecessary for this study.

which can be seen in (4). However, there was a great decrease in accuracy when dealing with the word 'children,' where the syllabic skeleton is CVCC.CVC in Standard American English. As the tableaux of 'children' will demonstrate, factors having to do with the syllable in relationship to its surrounding syllables and allophones, such as Syllable Contact, can also influence whether or not epenthesis is used by Najdi speakers of L2 English.

MDH can account for why the Najdi speakers would have more difficulty with the CVCC syllable structure word-medially versus word finally. Because many languages that allow word-edge consonant clusters do not allow word-medial consonant clusters, word-edge consonant clusters are considered to be less marked than word-medial consonant clusters. Thus, L2 English speakers should have greater difficulty with word-medial consonant clusters, such as the cluster in 'children' than they have with word-edge consonant clusters, such as 'from' and 'want.'

5.4 Najdi L2 English OT Tableaux

In order to analyze the L2 English data presented in the beginning of this chapter and compare it to the Najdi tableaux in Chapter 4, this section begins by using the same constraints that were used in Chapter 4 to analyze Najdi forms. These constraints are listed again in (7). The final constraint listed is the Alignment constraint used specifically for Najdi Arabic.

(7) Constraints used for analysis of epenthesis and syllabification in Arabic dialects

    a. *COMPLEX
        No complex onsets or codas.

    b. ONSET
        Syllables must have an onset.

    c. PEAK
        Syllables must have a vowel.

    d. MAX-IO
        Input segments must have output segments; deletion is prohibited.

    e. DEP-IO
        Output segments must have input correspondents; epenthesis must not occur.

    f. SYLLABLE CONTACT^{*RISE}
        Sonority cannot rise across syllable boundaries.

    g. SYLLABLE CONTACT^{*FALL}
        Sonority cannot fall across syllable boundaries.

5.4.1 Tableaux of a Form Containing a Word-Initial Biconsonantal Cluster

In order to determine why Najdi speakers don't use epenthesis to break up word-initial biconsonantal clusters when both Cairene and Iraqi speakers do, the word 'from' will be analyzed. It is worth noting that 'from' and 'floor,' the form analyzed in Cairene and Iraqi speech, have a very similar biconsonantal cluster when features are considered: both clusters are comprised of a voiceless labiodental fricative + liquid. Based on the candidates for 'floor' in Chapter 3, the candidates for 'from' that will be considered are presented in (8) with the constraint *COMPLEX.

(8) Tableau of 'from' candidates violating *COMPLEX

/fɹəm/	*COMPLEX
a. from	*!
b. fom	
c. fi.rom	
d. if.rom	
e. ʔif.rom	

The actual Najdi output for the English word 'from' is [from], which is candidate a in the

tableaux. With *COMPLEX as the highest-ranked constraint, the actual output is immediately

eliminated because its word-initial biconsonantal cluster is a violation of *COMPLEX. The

other four candidates avoid violating *COMPLEX either by epenthesis or deletion. Thus, in

order for the output to emerge as the optimal candidate, *COMPLEX must be ranked equal to

or below MAX-IO and DEP-IO. The Tableau in (9) illustrates the output emerging as the

optimal candidate with MAX-IO and DEP-IO ranked above *COMPLEX.

(9) Najdi pronunciation of 'from' tableau with ranking MAX-IO, DEP-IO >>

*COMPLEX

/fɹəm/	MAX-IO	DEP-IO	*COMPLEX
a. ☞ from			*!
b. fom	*!		
c. fi.rom		*!	
d. if.rom		*!	
e. ʔif.rom		*!*	

As the tableau in (9) illustrates, *COMPLEX must not be ranked as high as MAX-IO or DEP-IO.

This ranking is congruent with Abboud's (1979) description of syllables in Najdi in which

complex codas and word-initial complex onsets are allowed and frequently occur. In the

case of English words beginning with a biconsonantal cluster, the alignment constraint

appears to be irrelevant because the correct optimal candidate emerges with only three

constraints. Thus, in order to illustrate the interaction between all the constraints listed in

(11), a form with a word-internal triconsonantal cluster must be analyzed.

5.4.2   Tableaux of a Form Containing a Word-Medial Triconsonantal Cluster

As was illustrated in Chapter 3, an English word containing a word-medial triconsonantal

cluster requires the application of more constraints, such as SYLLABLE CONTACT[*RISE/*FALL] in

order for the optimal candidate to emerge. In Chapter 3, the Cairene and Iraqi pronunciation

of the word 'children' was analyzed; the same English word is used in this chapter to

examine the interaction and ranking of constraints for Najdi Arabic speakers of L2 English.

The same six candidates used for tableaux of 'children' in Chapter 3 will be used again. The

tableau in (11) shows the evaluation of these candidates with the ranking established for the

Cairene and Iraqi L2 English.

(10)   Tableau of 'children' with ranking MAX-IO, ONSET, SYLLABLE
    CONTACT^{*RISE/*FALL} >> *COMPLEX >> DEP-IO

a.   Tableau of 'children' using SYLLABLE CONTACT^{*RISE}

/tʃɪl.dɹɛn/	MAX-IO	PEAK	ONSET	σCONT^{*RISE}	*COMPLEX	DEP-IO
a. tʃil.dren					*!	
b. tʃild.ren				*!	*	
c. tʃil. əd.ren			*!	**		*
d. tʃi.ləd.ren				*!		*
e. ☞ tʃil.də.ren						*
f. tʃil.den	*!					
g. tʃil.d.ren		*!		*		

b.   Tableau of 'children' using SYLLABLE CONTACT^{*FALL}

/tʃɪl.dɹɛn/	MAX-IO	PEAK	ONSET	σCONT^{*FALL}	*COMPLEX	DEP-IO
a. tʃil.dren				*	*!	
b. tʃild.ren					*	
c. ☹ tʃil. əd.ren			*			*
d. ☹ tʃi.ləd.ren				*		*
e. tʃil.də.ren				**!		*
f. tʃil.den	*			*!		
g. tʃil.d.ren		*		*!		

The tableau in (10) illustrates that in their L2 English the Najdi speakers seem to have

SYLLABLE CONTACT^{*RISE} ranked above SYLLABLE CONTACT^{*FALL},which appears not to be

relevant in the emergence of the optimal candidate.

One issue left to be addressed with the Najdi hierarchy concerns word-initial

biconsonantal clusters. While (10a) causes the output to emerge as the optimal candidate for

'children' it cannot be applied to 'from' because, in order for the Najdi output of 'from' to

emerge, *COMPLEX must be ranked below DEP-IO.

5.4.3 Discrepancy in Ranking

While the ranking in (10a) causes the output to emerge as the optimal candidate for a form containing a word-medial triconsonantal cluster, this ranking does not work for the Najdi pronunciation of forms containing word-initial biconsonantal clusters, such as 'from.' This issue is illustrated in the tableau in (11) where the ranking from (10) is applied to 'floor.'

(11)   Tableau of 'floor' with ranking MAX-IO, PEAK, ONSET, SYLLABLECONTACT^{*RISE} >> *COMPLEX >> DEP-IO

/fɹəm/	MAX-IO	PEAK	ONSET	σCONT^{*RISE}	*COMPLEX	DEP-IO
a. ☞ from					*!	
b. fom	*!					
c. ⊗ fi.rom						*
d. if.rom			*!	*		*
e. ʔif.rom				*!		*
f. f.rom		*!		*		

The actual output is candidate a, but in (11) this candidate is eliminated because it violates *COMPLEX. Altering the current ranking so that the output for 'from' emerges as the optimal candidate will result in a ranking that does not allow the output for 'children' to emerge as the optimal candidate. It would be possible to add constraints and re-rank them in order to cause the correct optimal candidate to emerge in both cases; however, I would like to propose that it is possible that these Najdi speakers of L2 English have more than one ranking of constraints in their interlanguage, and their more nativelike pronunciation of 'from' can be explained using the Markedness Differential Hypothesis.

According to the MDH, if an L2 learner is faced with a structure in the target language that is more marked than a similar structure in the speaker's native language, the learner will have more difficulty with that form. While consonant clusters are marked in that cross-linguistically complex syllable margins tend to be avoided, some consonant clusters are

more marked than others. As mentioned earlier, word-medial triconsonantal clusters are more marked than word-initial biconsonantal clusters. Thus, MDH would predict that L2 learners would have more difficulty with word-medial triconsonantal clusters than they have with word-initial biconsonantal clusters. The results of this Najdi data collection support MDH because the subjects had a much lower accuracy rate with forms containing word-medial triconsonantal clusters than the rate of accuracy for word-initial biconsonantal clusters.

Another important factor in determining the markedness of complex syllable margins is sonority. The issue of sonority was discussed because it plays a role in the constraint Syllable Contact, which stipulates that sonority may not rise across syllable boundaries. However, another constraint related to sonority comes from the Sonority Sequencing Principle (Clements 1990), which is defined in (12) below.

> (12)   Sonority Sequencing Principle (Clements 1990)
> Complex onsets must rise in sonority, while complex codas fall in sonority.

English consonant clusters, with the exception of /s/ + stop + liquid clusters, obey the Sonority Sequencing Principle (SSP). For instance, in the word 'from,' the sonority rises from the fricative /f/ to the liquid /ɹ/ before reaching its peak at the nucleus of the syllable.

Word-initial biconsonantal clusters in Najdi Arabic often violate SSP, as the example forms taken from Abboud (1979) in (13) demonstrate.

> (13)   Najdi word-initial biconsonantal forms violating SSP (forms from Abboud 1979)
> a. nxa.dim
> b. mti.labb.sn
> c. mti.bart.lin

The example form in (13a) violates the SSP because the sonority falls from /n/, which is a nasal, to /x/, which is a fricative. The forms in (13b) and (13c) violate SSP because the

sonority falls from the nasal /m/ to the stop /t/. Due to Najdi Arabic's violations of SSP, word-initial biconsonantal clusters in Najdi are more marked than word-initial biconsonantal clusters in English, which obey SSP.

Since Najdi Arabic's word-initial biconsonantal clusters are more marked than word-initial biconsonantal clusters in the target language English, the Markedness Differential Hypothesis would also predict that Najdi speakers would not have difficulty with English words containing word-initial biconsonantal clusters because the target structure in the L2 is less marked than the target structure in the L1 due to Najdi word-initial biconsonantal clusters violating SSP.

Although Najdi Arabic contains word-medial triconsonantal clusters, some of the subjects in my study did experience difficulty in producing forms such as 'children,' 'translating,' and 'apartment.' This evidence could be interpreted as supporting Tarone's (1980) stronger version of MDH where markedness may take precedence over L1. Even though the subjects' L1 has word-medial triconsonantal clusters, the syllables in 'children' were produced accurately only 39% of the time. This low rate of accuracy could be interpreted as evidence against the subjects merely transferring syllable structures and rules from their L1. One interpretation is that the relatively low rate of accuracy with word-medial triconsonantal clusters when compared to word-initial biconsonantal clusters is due to the fact that word-medial triconsonantal clusters are universally more marked than word-initial biconsonantal clusters.

Since the subjects in my study still had a far lower rate of accuracy when dealing with English triconsonantal clusters than biconsonantal clusters, even though both structures exist in their L1, this data seems to support a stronger version of MDH. The Markedness

Differential Hypothesis would account for this with the fact that triconsonantal cluster are more marked than biconsonantal clusters. After taking this into account, the different hierarchies for biconsonantal clusters versus triconsonantal clusters may have to do with these learners of L2 English using a different ranking of constraints due to the different levels of markedness of word-initial biconsonantal clusters versus word-medial triconsonantal clusters.

5.5 Non-Vowel Epenthesis

Another form encountered in my study used a different process of epenthesis to avoid violating SYLLABLE CONTACT. The word 'apartment,' much like 'children,' not only contains a triconsonantal cluster; it also violates the SYLLABLE CONTACT^{*RISE} constraint when syllabified in accordance with the syllable boundaries reported by Abboud (1975). In (15) and (16) below, the recorded pronunciations of 'apartment' and 'translating' are compared to a pronunciation without epenthesis. Syllable boundaries are marked with a bold period, and epenthetic segments are marked in bold.

(14)   Pronunciation of 'apartment'
     a. without epenthesis (not recorded):   [ʔə **.** part **.** mɛnt]
     b. with epenthesis(recorded):   [ʔə **.** par **.** t✋**.** mənt]

(15)   Pronunciation of 'translating'
     a. without epenthesis (recorded):   [tɹanz **.** le **.** tiŋ]
     b. with epenthesis (also recorded):   [tɹan **.** s✋ **.** le **.** tiŋ]
     c. with vowel epenthesis (recorded):   [tɹan **.** zə **.** le **.** tiŋ]

If the Najdi speakers merely transferred syllabification rules from their L1, epenthesis should not be necessary: the word-medial triconsonantal cluster would be syllabified for coda maximization, as it is in (14a) and (15a), even if it meant violating SYLLABLE CONTACT^{*RISE} (See Chapter 4). In (15a), which is not a form that was attested in this study, no epenthesis

occurs, and SYLLABLE CONTACT$^{*\text{RISE}}$ is violated because the sonority must rise between syllable boundaries between the [t] at the end of the second syllable and the [m] at the beginning of the third syllable. Instead of using epenthesis to insert a vowel between [t] and [m], though, something else is epenthesized.

A brief pause, indicated by the symbol ✋, was inserted between the [t] and [m]. I argue that this pause can be analyzed with the hypothesis proposed in Cole and Miyashita (2006) where pauses in haikus are analyzed as silent moras, which are represented with the symbol ✋. In Cole and Miyashita's (2006) analysis, these silent moras function to regulate the length of lines of Japanese poetry. In the Najdi form [ʔə.par.t✋.mənt], the silent mora prevents a violation of SYLLABLE CONTACT$^{*\text{RISE}}$ in (15a) where [t] is in a coda position, sonority rises across syllable boundaries from the [t] coda to the [m] onset of the following syllable. Since a silent mora is neither vowel nor consonant, it is not on the sonority scale; thus, SYLLABLE CONTACT$^{*\text{RISE}}$ is not violated when a silent mora separates [t] from [m].

Like the epenthetic vowel causes a different syllabification than the form without epenthesis, this epenthetic pause alters the syllabification, which can be seen in (15b) and (16b). The fact that both [tɹan.zə.le.tiŋ] and [tɹan.z✋.le.tiŋ] were recorded in this study seems to support the hypothesis that the epenthetic pause serves the same function as the epenthetic vowel. Also, both the epenthetic vowel and the epenthetic silent mora cause a resyllabification of the form that results in an additional syllable: the form in (15a) has three syllables, while the form in (15b) has four. Likewise, the form in (16a) has two syllables, while the forms in (16a) and (16b) contain three syllables. Since *COMPLEX is ranked very low and another complex coda exists in [ʔə.par.t✋.mənt], the silent mora is also not

motivated by *COMPLEX. Instead, the silent mora appears to be primarily serving the

function of avoiding a violation of SYLLABLE CONTACT*RISE, as proposed above. The tableau

in (17) illustrates the role of SYLLABLE CONTACT*RISE in the output.

(17) Tableau of 'apartment' with ranking MAX-IO, PEAK, ONSET, SYLLABLE
CONTACT*RISE >> *COMPLEX >> DEP-IO

/ʔə.par.ʔmənt/	MAX-IO	PEAK	ONSET	σCONT*RISE	*COMPLEX	DEP-IO
a. ʔə.par.tmənt					**!	
b. ʔə.part.mənt				*!	**	
c.☹ʔə.par.t✋.mənt		*!			*	*
d.☞ʔə.par.tə.mənt					*	*
e. ʔə.par.mənt	*!				*	
f. ʔə.par.t.mənt		*!		*	*	
g. ʔə.par.təm.ənt			*!	*		

As (17) illustrates, the ranking established for the Najdi pronunciation of 'children' does not

cause the output for 'apartment' to emerge as the optimal candidate because the syllable

containing the silent mora violates PEAK by not having a vowel. It could be that, instead of a

high-ranking PEAK, there is a high-ranking constraint that pertains to the minimal number of

moras in a syllable. If, instead of PEAK, a constraint that required all syllables to have at least

one mora, all the candidates that previously violated PEAK would still violate this

constraint—with the important exception of the output for 'apartment.'[7] This constraint is

presented in (18) below.

(18) Minimum Mora Requirement (MMR)
        A syllable must contain at least one mora.

In the tableau in (19), this MMR has replaced PEAK, causing the output to tie with candidate

d.

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[7] The analysis provided here assumes that when the consonant [t] in 'apartment' appears as its own syllable, as
it does in candidate f, it is not counted as a mora; thus, the syllable [t] in candidate f does not have any moras.

(19)   Tableau of 'apartment' with ranking MAX-IO, MMR, ONSET, SYLLABLE
        CONTACT*RISE >> *COMPLEX >> DEP-IO

/ʔə.par.ʔmənt/	MAX-IO	MMR	ONSET	σCONT*RISE	*COMPLEX	DEP-IO
a. ʔə.par.tmənt					**!	
b. ʔə.part.mənt				*!	**	
c.☞ʔə.par.t🖐.mənt					*	*
d.☞ʔə.par.tə.mənt					*	*
e. ʔə.par.mənt	*!				*	
f. ʔə.par.t.mənt		*!		*	*	
g. ʔə.par.təm.ənt			*!	*		

While candidate c, the actual output, no longer gets eliminated, it ties with candidate d

for optimal candidate. Both candidates c and d use epenthesis in the same place. In both

cases, the epenthetic segment prevents a second violation of *COMPLEX; however, the fact

that the epenthetic segment prevents a violation of SYLLABLE CONTACT*RISE seems to be the

primary reason for epenthesis. If the primary reason for inserting the silent mora were to

avoid violations of *COMPLEX, then an additional epenthetic segment should have been

inserted to break up the word-final complex coda also. Thus, both epenthetic segments

prevent SYLLABLE CONTACT*RISE from being violated, as well as avoiding a second violation

of *COMPLEX. What motivates a speaker to insert a silent mora instead of a vowel? It is not

within the scope of this thesis to explore this question in-depth, but I would like to suggest

the possibility that it has to do with featural harmony, specifically with voice. The epenthetic

silent mora follows a voiceless stop [t], while the epenthetic [ə] in 'children' followed the

voiced stop [d]. Thus, in these two cases the epenthetic segment shares the same feature of

voice with the consonant that precedes it.

The two forms of 'translating' that used epenthesis seem to support the notion that that the feature of voice in the epenthetic segment seems to correspond to the preceding consonant. In my study, two forms using epenthesis were recorded: [tɹan.s✋.le.tiŋ] and [tɹan.zə.le.tiŋ]. Thus, an epenthetic vowel was used in some instances, while an epenthetic silent mora was used in other instances. When an epenthetic schwa was inserted, it always came after [z], which is voiced; however, when an epenthetic silent mora was used, it always followed [s], which is voiceless. Hence, the forms *[tɹan.z✋.le.tiŋ] and *[tɹan.sə.le.tiŋ] were not recorded in this study.

5.6 Conclusion

Najdi Arabic speakers seem to have less difficulty than Cairene Arabic and Iraqi Arabic speakers when producing English words that begin with a biconsonantal cluster. Similarly, these speakers produced words ending in a biconsonantal cluster with very few errors. Both word-initial biconsonantal onsets and word-final biconsonantal codas are exhibited in Najdi Arabic; thus, this evidence could be seen as supporting CAH if transfer of allowed syllable structures from the L1 to the L2 is assumed.

However, the subjects' production of word-initial triconsonantal clusters does not appear to support CAH. Unlike the scarce errors with biconsonantal clusters at word edges, numerous instances were recorded where the speakers in the study used epenthesis when pronouncing words such as 'children' and 'apartment,' which contain a word-medial triconsonantal cluster. Although word-medial triconsonantal clusters are allowed in Najdi Arabic, the speakers had a significantly lower rate of accuracy with this structure in their L2 English than they did with word-edge biconsonantal clusters. CAH would predict that the

subjects would not have difficulty with word-medial triconsonantal clusters because this structure is permitted in their L1, but that was not the case in this study. A strong version of MDH where markedness may take precedence over the L1 would predict that the subjects would have a lower rate of accuracy when producing word-medial triconsonantal clusters than when producing word-edge biconsonantal clusters because word-medial triconsonantal clusters are more marked. Thus, even though the L1 permits both structures, this strong version of MDH would predict that the subjects will have a lower rate of accuracy with L2 word-medial triconsonantal clusters than the rate of accuracy for L2 word-edge biconsonantal clusters.

Rather than functioning to avoid violations of *COMPLEX, the epenthesis in Najdi speakers' L2 English seems to serve the purpose of avoiding a rise in sonority across syllable boundaries. Thus, the ranking of the SYLLABLE CONTACT^{*RISE} constraint above *COMPLEX is pivotal in the analysis of Najdi pronunciations of English words containing consonantal clusters.

While the Cairene and Iraqi data could support the Contrastive Analysis Hypothesis because these speakers use epenthesis to break up consonant clusters in their target language, which would be predicted because their native language does not allow consonant clusters, the Najdi data does not conform to CAH predictions. Because consonant clusters are allowed in this dialect of Arabic, CAH would predict that Najdi speakers would have fewer pronunciation errors with consonant clusters. The Najdi pronunciation of word-initial biconsonantal clusters, such as 'from', with 100% syllabic accuracy does conform to this prediction; however, the epenthesis used in word-medial triconsonantal clusters such as 'children,' 'translating,' and 'apartment' goes against the CAH prediction.

While the data collected in this study do not appear to conform to CAH predictions, they do support the two hypotheses presented in the end of Chapter 4, which are restated in (20) below.

(20) Hypotheses for Najdi L2 English syllable structure:

a. The learners should not have difficulty with English word-initial biconsonantal clusters because English word-initial biconsonantal clusters are less marked than Najdi word-initial biconsonantal clusters when the Sonorancy Sequencing Principle (Clements 1990) is considered; thus, the Najdi speakers are moving from a more marked word-initial biconsonantal clusters that do not necessarily conform to SSP in their L1 to less marked word-initial biconsonantal clusters in their L2 English which abide by SSP.

b. Word-medial triconsonantal clusters are more marked than word-edge biconsonantal clusters, so Najdi speakers would be expected to have more difficulty with English words containing word-medial triconsonantal clusters than word-edge biconsonantal clusters, even though word-medial triconsonantal clusters exist in the speakers' L1.

The hypothesis stated in (20a) was supported by my study because the subjects naturalistically produced word-initial biconsonantal clusters with a 100% syllable accuracy rate; this high accuracy rate can be interpreted as evidence that the subjects do not have difficulty with word-initial biconsonantal clusters. The hypothesis in (20b) was also supported: even though the subjects have word-medial triconsonantal clusters in their L1, they did have a significantly lower rate of accuracy when producing this structure in their L2 English.

The epenthesis of a silent mora was an unexpected finding in this study, and further research should be done regarding this phenomenon. I would like to tentatively suggest that this silent mora might indicate transfer of the Arabic *sukuun*, a pause or 'silence' that is written as a diacritic in Arabic script. Further research of Najdi speakers' use of the *sukuun*

in their native language could be compared to this silent mora to determine if the *sukuun* motivates a silent mora in Najdi Arabic. Furthermore, research where the silent mora in Najdi speakers' L2 English is the focus of the study could shed light on when and why a silent mora is inserted rather than a vowel.

Many theoretical questions arise from epenthesis of silent moras. Since the silent mora does not represent an actual sound, how does it interact with OT constraints? Is epenthesis of a silent mora a lesser violation of DEP-IO than epenthesis of a vowel or consonant? New constraints dealing with silent moras may need to be proposed as more data is uncovered. As silent moras were not the intended focus of this research, it is not within the scope of this thesis to answer these questions.

CHAPTER 6: CONCLUSION

6.0 <u>Introduction</u>

In this thesis I have discussed epenthesis in Cairene, Iraqi, and Najdi speakers'

pronunciation of L2 English. My analysis of these speakers' use of epenthesis to break up

consonant clusters relies heavily on Itô's (1986, 1989) analysis of epenthesis in Cairene and

Iraqi where she describes the syllable template for both languages as being [CVC], and the

cause for inserting the epenthetic [i] in different places was due to the fact that in Cairene the

syllable template is mapped onto a form from left to right, while in Iraqi the template is

mapped from right to left.

Broselow (1983, 1984, 1988) compared epenthesis errors in Cairene and Iraqi speakers'

L2 English with epenthesis in their native language and found that the errors made by these

speakers regarding epenthesis were largely predictable based on epenthesis and syllables in

the speakers' native language. While English allows complex syllable margins, Cairene and

Iraqi use epenthesis to break up consonant clusters; hence, when Cairene and Iraqi speakers

encountered English words containing consonant clusters, they transferred the strategy of

epenthesis to break up consonant clusters from their native language to English.

However, one alternative to Broselow's hypothesis regarding transfer of syllable

structures from L1 to L2 is an approach focused on markedness. MDH states that when a

structure in the L2 differs from a structure in the L1, the level of difficulty that a learner has

acquiring that structure depends on the structure's markedness. Moreover, Universal

Principles (Eckman 1977) would suggest that even if speakers have a structure in their L1, if

the structure is marked they may still have difficulty acquiring that structure in their L2.

Studies such as Tarone's (1980) where speakers of an L1 that allowed more complex syllable

structures still made syllable errors in their L2 English at a similar rate as speakers of L1s where complex syllable margins are not allowed, seem to indicate that markedness plays a large role in L2 syllable phonology.

<u>6.1 Review</u>

Chapter 1 provided an introduction to the data examined in this thesis, as well as two hypotheses regarding the role of transfer and markedness in Second Language Acquisition: CAH (Lado 1957) and MDH (Eckman 1977). In Chapter 2, Ito's (1986, 1989) analysis of Cairene and Iraqi Arabic syllabification was presented to illustrate how syllabification and epenthesis works in these speakers' L1. The end of Chapter 2 illustrated how templatic syllabification can be applied to Cairene and Iraqi speakers' L2 English forms if transfer is assumed. However, as one of the purposes of this thesis is to illustrate that transfer is not the only explanation for these speakers' L2 English syllabification errors, Chapter 3 provided an OT analysis of the Cairene and Iraqi L2 English data to illustrate how markedness constraints interact with faithfulness constraints in these forms.

One of the disadvantages to analyzing the Cairene and Iraqi speakers' L2 English data is the fact that these dialects are very unlike English in syllable structure, so L2 English syllable errors can easily be explained using transfer. If a language that allows similar syllable structures to English, such as Najdi Arabic, has speakers who produce errors in their L2 English syllables, this evidence could be seen as support that some factor other than transfer is crucial when speakers are dealing with L2 syllables. The factor explored in this thesis is markedness because complex syllable margins are universally marked, which is to say that not all languages allow complex syllable margins, and those that do also have simple syllable margins.

In order to explore the role of markedness in L2 syllable errors, Chapter 4 introduced the Najdi Arabic dialect, focusing on syllable structures and sonority in this dialect. Unlike Cairene and Iraqi Arabic, in Najdi Arabic consonant clusters are found in the output in word-initial, word-medial, and word-final positions, which makes Najdi Arabic more like English as far as allowed syllable structures are concerned. After describing syllable structures in Najdi Arabic in Chapter 4, Chapter 5 discussed the data I collected from Najdi speakers of L2 English. Forms containing word-initial biconsonantal and word-medial triconsonantal clusters received most of the focus, as it was not within the scope of this thesis to deal with all types of consonant clusters. Tableaux that account for the Najdi pronunciation of L2 English forms such as 'from,' 'children,' and 'apartment,' are presented and discussed in Chapter 5. The final chapter of this thesis is meant to conclude the thesis; thus, Section 6.2 discusses the significance and implications of this thesis, while Section 6.3 proposes further research.

6.2 Significance and Implications

The major implication of this thesis is that the role of markedness in L2 speakers' syllable structures should not be underestimated. While studies in the past (Broselow 1983, 1984, 1988, Galal 2004) have assumed that transfer is responsible for L2 speakers' syllable errors when faced with complex syllable margins, these errors could be due to the universal markedness of complex syllable margins. When languages that for the most part don't allow complex syllable margins, such as Cairene Arabic and Iraqi Arabic, perhaps the most simple explanation for these speakers' errors in simplifying complex syllable margins in their L2 is transfer. However, if speakers of L1s that also allow complex syllable margins also make

errors in their L2 by simplifying complex syllable margins, that would support the position that some factor other than transfer is at least partially responsible for these errors.

In order to analyze how speakers of a different Arabic dialect deal with consonant clusters in their L2 English while simultaneously analyzing a language that is more like English in its allowance of complex syllable margins, I collected data from Saudi Arabians who attended the University of Montana at the time of this study. While several different dialects of Arabic are spoken in Saudi Arabia, the Najdi dialect was chosen for analysis because of the complex syllable structures allowed in the language.

The Contrastive Analysis Hypothesis would predict that Cairene and Iraqi speakers, whose native language allows few consonant clusters, would have more difficulty producing consonant clusters in their L2 than speakers whose native language not only allows but has frequent occurrences of consonant clusters. Unlike Cairene and Iraqi, Najdi Arabic allows consonant clusters (Abboud 1979); thus, according to CAH, they should have fewer errors in producing consonant clusters in their L2 than the Cairene and Iraqi Arabic speakers. The results of my study support this prediction in that no epenthesis errors with English words beginning with biconsonantal clusters were recorded. However, although word-medial triconsonantal clusters occur often in Najdi Arabic and are syllabified for coda maximization (Abboud 1979), numerous instances of Najdi speakers using epenthesis to break up word-medial triconsonantal clusters were found. Since word-medial triconsonantal clusters are allowed in Najdi, CAH would not predict that Najdi speakers would produce errors with this structure. These findings support the notion that another factor, namely markedness, is pivotal in L2 speakers' syllable errors.

An unexpected finding when analyzing the Najdi data was epenthesis of a silent mora between [t] and [m] in 'apartment.' This silent mora appears to be serving the purpose of blocking a rise in sonority from the [t] in the coda position to the [m] in the onset position. This notion of a silent mora serving important purposes in phonology is a relatively new concept, recently analyzed by Cole and Miyashita (2006) in Japanese poetry. The implications of finding the silent mora in Najdi Arabic speakers' L2 are numerous: to my knowledge, epenthesis of a silent mora in order to avoid constraint violation in L2 productions has not been studied before; rather, the focus was on consonant and vowel deletion and epenthesis. Epenthesis of a silent mora is another strategy that the L2 speakers in my study used to avoid violating markedness constraints, which begs the question: what are other strategies that L2 speakers use to avoid violating constraints in their interlanguage?

Not only does epenthesis of a silent mora have implications in the realm of Second Language Phonology, it also has implications about the universality of using silent moras. The silent mora is used in Japanese for metrical reasons and in Najdi Arabic for sonority and prosodic reasons. Arabic and Japanese languages are unrelated, so the fact that these two unrelated languages both use the silent mora suggests that it probably occurs in a variety of languages and serves a plethora of purposes. Further research should examine the silent mora in other languages, as well as researching whether epenthesis of a silent mora is a strategy transferred from the L1 Najdi Arabic to the L2, or if it is a strategy that occurs only in the speakers' interlanguage.

Beyond adding to research that supports a focus on markedness when examining L2 speakers' syllable errors, this thesis also adds to theoretical research done in OT and supports the use of OT when analyzing L2 data because OT clearly illustrates the role that different

markedness and faithfulness constraints play in determining the output of an L2 form. Moreover, this thesis illustrates how well OT combines with MDH in analyzing Second Language Acquisition phonology, which will hopefully encourage further analyses of L2 phonological data using OT.

Along with supporting the use of OT with L2 phonological data, an implication of this thesis is that L2 data that has been previously analyzed using a non-OT or CAH-based approach should be reanalyzed to determine if using OT can provide a more markedness-based account for the same data. As was illustrated in this thesis, L2 data that has been previously accounted for with transfer from the L1, such as Broselow's (1983, 1984, 1988) data from Cairene and Iraqi Arabic speakers of English, could possibly also be accounted for using an approach such as OT that focuses on markedness.

Focusing on universal principles rather than the L1 and providing data that support a more markedness-based approach has a greater implication in the ongoing debate in the field of Second Language Acquisition regarding whether L2 learners have access to Universal Grammar (UG), which is the system of principles and operations of human languages that people use when developing their first language. Those who argue that learners do not have access to UG and must use their L1 in order to learn a second language would favor CAH, or a transfer-based approach to explaining L2 data. This camp would state that since learners either have no access to UG or indirect access through their L1, they will have difficulty with L2 structures that are not exhibited in the L1 and produce errors where they alter the L2 structure to make it allowable by the L1. However, if learners have direct access to UG, which theoretically contains OT constraints and universal markedness principles, then they might still make errors when dealing with marked structures in the L2, even if that structure

is exhibited in speakers' L1. Both Tarone's (1980) study and the study presented in this thesis provide evidence that even speakers of an L1 that allows more complex syllables will make syllable errors in their L2 English, which could be interpreted as supporting that L2 learners have at least indirect access to UG and possibly direct access to UG.

The alteration proposed in Chapter 3 for the SYLLABLE CONTACT constraint further contributes to OT research by splitting the constraint into two separate constraints that can be used to explain data in a wider variety of languages. Since it seems that Iraqi Arabic ranks SYLLABLE CONTACT^{*FALL} above SYLLABLE CONTACT^{*RISE}, other languages may have a high ranking of this constraint, although it seems that cross-linguistically sonority rising across syllable boundaries is more marked than sonority falling across syllable boundaries. Theoretically, all languages have both constraints, but it seems that languages should have one ranked higher than the other because the two constraints can be seen as battling with each other.

6.3 Further Research

The OT analysis in Chapter 3 provides a hierarchy of constraints that account for Cairene and Iraqi speakers' pronunciation of English words containing a word-initial biconsonantal cluster or a word-medial triconsonantal cluster. It was not within the scope of this thesis to cover the speakers' pronunciations of other types of consonant clusters that occur in English, such as word-initial triconsonantal clusters, word-medial quadriconsonantal clusters, and word-final consonant clusters; I suggest that further research be done to provide an OT analysis for consonant clusters not covered in this thesis.

The OT analysis provided here also does not compare tableaux of non-native pronunciations with tableaux of native pronunciations of these words in order to determine

how different the hierarchy of constraints for Cairene and Iraqi speakers of L2 English is from the hierarchy of constraints for Standard American English. Moreover, this thesis does not provide tableaux of Cairene and Iraqi words where the input contains a consonant cluster. Further research should compare the tableaux of Cairene and Iraqi pronunciation of words such as 'floor' and 'children' to tableaux of Standard American English pronunciation of these words, as well as tableaux of Cairene and Iraqi forms where the input contains consonantal clusters to analyze what exactly has been transferred from the speakers' native language, what appears to come from the target language (English), and what must have arisen from the speakers' Interlanguage. In order to accomplish this, more data should be collected from native speakers of Cairene and Iraqi Arabic.

In order to add further support to the strong role of markedness in L2 syllables, more OT analyses of L2 syllables in a wider variety of languages should be done. This thesis focused solely on dialects of Arabic, but in order to discuss L2 syllables cross-linguistically, speakers of L1s from different language families should be analyzed and compared.

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Sentences for Najdi Arabic Data Collection

1. I am not from Spain.

2. I prefer plastic sacks for my groceries.

3. He wants to skip class because he dislikes translating.

4. Fred has three children.

5. The group was blacklisted after publicly opposing the war.

6. She wears a sweater and a skirt.

7. Drake wants a transcript of the TV show.

8. The children skate in the street.

9. The Boy Scout troop still strikes out consistently.

10. Brenda needs a brain transplant.