WORD-INITIAL CONSONANT CLUSTER PATTERNS IN THE ARABIC NAJDI DIALECT

by

Bandar Abdulaziz Alghmaiz

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Approved by:

Dr. James A. Berry, Chair

Dr. Karen Baertscch

Dr. Krassimira Charkova

Graduate School
Southern Illinois University Carbondale
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Unlike in Classical Arabic, this study hypothesized that word-initial consonant clusters exist in Najdi Arabic as a result of first vowel deletion. The goal of this study was to investigate the word-initial consonant cluster patterns of Najdi Arabic and measure the sonority scale of this particular position. Ten native Najdi Arabic speakers were asked to pronounce 24 words and 24 sentences that contained all the possible consonant cluster patterns that could occur in Najdi Arabic. The output of the subjects revealed that Najdi Arabic does have initial consonant clusters in certain environments and that the minimum sonority distance was one step between the first and second onsets. The study found that the sonority distance between the first and second onsets plays a role in forming initial consonant clusters in Najdi. Additionally, the existence of less-marked consonant clusters was found to be more frequent than the more marked ones. Finally, the study proposed examining the pattern of the deleted vowel in future studies to determine whether it plays a role in the results.

"In the name of God, the Most Gracious, the Most Merciful"

Dedication

With a deep feeling of gratitude, to my beloved wonderful mother Jwaher Alfeys, and my ever-supportive father Abdulaziz Alghmaiz, "My Lord, have mercy upon them as they brought me up [when I was] small" *(Holy Quran, Isra 17:23-24).* To my sweet and lovely wife, Moody Alsaheel. And to the rest of my family members: my grandmother Hailah Abdullah, my uncle Yousef Alfeys, my brother Abdullah and my sisters Bushra, Hailah, Afnan, Lama, and Ala'nood. Furthermore, to those relatives and friends who have been concerned for me and wished me the best of luck in my academic life. To them I dedicate my thesis work.

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CHAPTER 1

INTRODUCTION

Investigating the phonological differences between the Classical Arabic language and the dialects derived from it is an interesting and expanding field. Although the intricacies of Classical Arabic and the dialects derived from it make the study of them difficult, in the last few decades there is a growing interest among linguists in studying Arabic dialects. Classical Arabic or Standard Arabic, as some other researchers call it, is the largest member of the Semitic language family (Watson, 2002). Classical or Standard Arabic is the language that is taught in the school of all Arabic countries and used in official contexts (Chentir, Guerti, & Hirst, 2008). The Arabic speaking countries consist of Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, and Yemen.

Over 200,000,000 people are estimated to speak some dialect of Arabic, and there are over 30 different varieties of dialectical Arabic (Shah, 2007). The variations between the Classical Arabic language and Arabic dialects differ from one dialect to another as a result of some historical and geographical factors. Moreover, in every Arab nation, there are different dialects; each one of them has its own phonological features and shares Classical Arabic linguistic features in a different way. Thus, some western linguists, like Jonathan Owens, describe Arabic as a puzzle (Owens, 2006). Perceiving Arabic as a difficult language is not surprising, especially for those who delve into its secrets, due to the fact that it is hard to prove whether or not the dialects derived from Arabic are correlated (Haddad &Yaseen, 2007).

This study examined the Najdi dialect, which is one of the best known Saudi dialects since it is spoken in and around the capital city of Saudi Arabia, Riyadh, and it is the dialect of the royal family (Omar, 1975). In some research, Najdi Arabic may refer to the dialect spoken in the central region of Saudi Arabia, which covers a much larger area than the area that is in and around Riyadh, and in those studies Najdi was divided into Southern Najdi and Northern Najdi dialects (Abboud, 1979; Ingham, 1994). However, in this study, the Najdi dialect means the dialect spoken in and around Riyadh, which is the main area of this particular dialect since it is located in the center of the Najdi region.

According to Ingham (1994), phonologically, the Najdi dialect differs from Classical Arabic in some features. One of these features is the phonemic inventory. All the phonemes that exist in Classical Arabic exist in Najdi as well but not vice versa. However, the frequency of their existence is varied since Najdi has extra phonemes (shown with asterisk in Table 1) that are in some environments substituted with some of those phonemes existed in Classical Arabic. Table 1 shows the phonemic inventory of consonants in Classical and Najdi Arabic as presented by Al-Feneekh (1983), Al-Sweel (1981), and Ingham (1994).

Table 1

Classical and Najdi Arabic Consonants Inventory

Manner of Articulation	Bilabial	Labiodentals	Dental	Alveolar	Postalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stop	b			t d tˤ dˤ			k g*	q		?
Nasal	m			n						
Affricate				ts*	dʒ					
Fricative		f	θ ð ðˤ	s z sˤ	ʃ		x ɣ		h ʕ	h
Approximant				r		j				
Lateral approx				l						
Glide	w									

Note. * means exists in Najdi only.

This particular dialect was chosen for two reasons. First, Najdi native speakers can easily pronounce and master Classical Arabic phonotatics due to the relative closeness of their dialect to Classical Arabic. Thus, it is meaningful to have some of them as a sample to compare the differences between their dialect and Classical Arabic. To illustrate that, most native speakers of Egyptian dialects have difficulty in pronouncing the pharyngealized voiced alveolar plosive /$d^{ˤ}$/ that exists in Classical Arabic; thus, the change they made in pronouncing this particular sound is an inability of pronouncing the original sound in general. Najdi speakers, however, have no problem in following either the Najdi or Classical Arabic system in their pronunciation. Second, the researcher believes that he can observe the target domain in Najdi more precisely than other dialects since it is his mother tongue.

Abboud's (1979) study was one of the oldest linguistic papers that shed a light upon the Najdi dialect. The author started his paper by showing the importance of studying this particular

dialect. He observed, “The dialects spoken in the Najd of Saudi Arabia have striking features which not only are unknown or unreported in other dialects but also retain some characteristics of the 'Arabiyya and of ancient dialects of the peninsula reported by the Arab grammarians. On both these counts, they are of paramount importance for synchronic, comparative and historical dialectology” (Abboud, 1979, p. 467).

It is known that the Classical Arabic language allows no initial consonant cluster at all (Abushihab, 2010). However, this study hypothesizes that there is initial consonant cluster in Najdi syllable structure as a result of historical changes. Researchers reported many syllable changes in different languages over time. For example, in Pali, a CCV syllable like /ambra/ changed to a CV syllable /amba/ (Vennemann, 1988, p. 14). Also, Glowacka (2001) demonstrated how British native speakers created new clusters in their casual speech by deleting unstressed vowels that fall between two voiceless obstruents. Furthermore, this phonological phenomenon was found in certian Arabic dialects like Ammani (Daana, 2009) and some Yemeni dialects (Al Hammadi, Luwa, & Yaari, 2012).

The purpose of this study was to investigate the patterns of initial consonant cluster produced in the Najdi dialect, and measure their sonority scale. Knowing in which environments the initial consonant cluster occurs in Najdi can help to measure the sonority scale of the dialect. Also, this explains why and where a vowel in Classical Arabic must or can be omitted in this particular dialect. Accomplishing these two findings was the primary goal of this study. Furthermore, determining where an initial consonant cluster occurs, and its sonority scale in a language, contributes to explaining some phonological issues in other research. In a similar manner, knowing the patterns of initial consonant clusters in a language helps in determining

some syllable structures. Also, this helps to explain why the speakers of that language have difficulty in pronouncing some words in a language that is foreign to them.

This work is organized as follows. Chapter two is a literature review that describes Classical Arabic syllable structure in comparison to universal syllable structure, and briefly explains the theories related to the study. After that, it summarizes previous related studies. Chapter three describes the methodology and the data that the researcher used to elicit the research goal. Chapter four presents the results that the researcher obtained via this study. Finally, chapter five discusses and interprets the results from chapter four. Also, it compares the results of this study to the other studies that were mentioned in the literature review.

CHAPTER 2

LITERATURE REVIEW

This chapter briefly explains the universal syllable structure and classical Arabic syllable structure patterns. After that, it presents two theories that closely relate to the study's problem. Finally, it gives an overview of several studies that shed a light upon initial consonant cluster in Najdi and other Arabic dialects linguistically.

Before examining the Najdi dialect syllable structure, it is important to understand the Classical Arabic syllable structure and some universals. The common patterns of syllable structure in all languages comprise four sequences: CV, V, CVC, VC. Specifically, there is a consensus among most linguistic researchers that the CV syllable is an absolute universal syllable pattern across all world languages. Thus, some phoneticians call this pattern the core syllable structure in all languages. Also, it is common in most languages to have two or more Cs in one syllable with no vowel in between, which is called a cluster (Carlisle, 2001).

As for Classical Arabic syllable structure, all vowels must be preceded by only one consonant and can be followed by up to two consonants, and that can be illustrated by the following formula CV (V) (C) (C). In other words, there is no initial consonant cluster allowed in Classical Arabic, and no syllable begins with a vowel. Thus, there are CV, CVV, CVC, CVCC, CVVC, and CVVCC syllable structures in Classical Arabic (Abushihab, 2010; Chentir, Guerti, & Hirst, 2009).

2.1. Theories Related to the Study Problem

2.1.1. Sonority Sequencing Principle. Clusters are restricted by a coherent phonetic system. This system is called the Sonority Sequencing Principle (SSP). The SSP theory requires

each C in an initial consonant cluster to be higher in sonority than the preceding one and lower than the following one. Thus, the first C of an initial consonant cluster must be the lowest in sonority, and the final C is the highest in sonority. In the opposite position, the SSP requires a final cluster, which is called a coda cluster, to have the sonority decreasing, just the reverse of the initial cluster. The consonants' sonority hierarchy is distributed by their manner of articulation as follows (Carlisle, 2001).

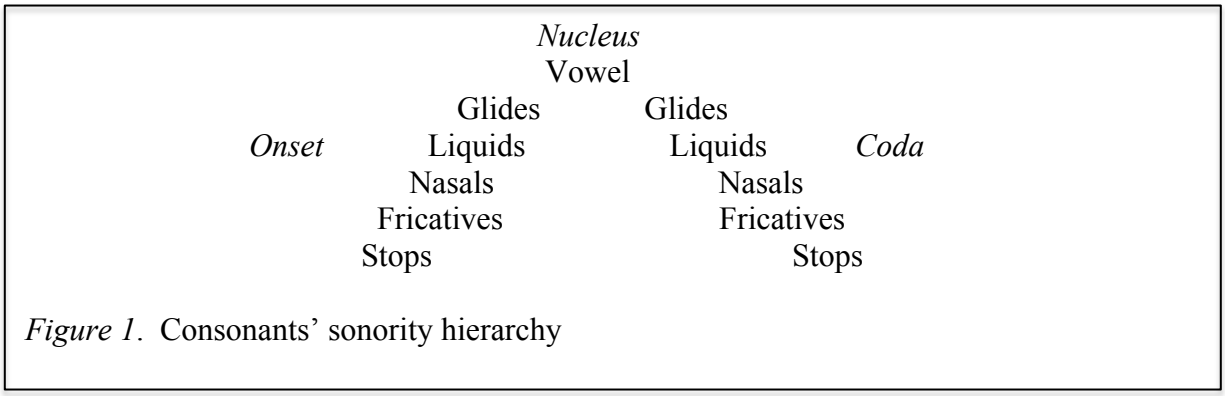

Figure 1. Consonants' sonority hierarchy

Although the SSP theory can explain how the sonority hierarchy should be ranked, it cannot distinguish exactly between a good cluster and a bad one. For example, /tl/ and /pl/ have the same sonority slope, but only /pl/ is accepted as initial consonant cluster in English (Duanmu, 2002). Thus, in this study, the instrument cannot exactly determine which phonemes can behave as the first C in an onset cluster and which ones for the second C, but it can determine how many steps in the sonority scale the subjects will allow.

Analyzing the results of the present study based on the SSP theory would definitely help to determine and examine how far the SSP theory applies with regard to Najdi word-initial consonant cluster patterns. Moreover, referring to the SSP theory while analyzing the results can indicate how the Najdi initial consonant cluster works due to the fixed scientific rules regarding

this particular matter. Therefore, this study mainly relied on the SSP as the main theoretical framework of reference.

There are many phonological studies and experiments in which the SSP theory has played an important role (Carlisle, 1991b). However, those studies and experiments had different approaches in applying it. Some of them were conducted to investigate the validity of the theory by examining participants with several words that follow the SSP system and some other words that go against its hierarchy. One of these studies was conducted by Carlisle (1991b). The researcher investigated the effectiveness of the Sonority Sequencing Principle on the production of /sl-/ and /st-/ onsets by 11 native speakers of Spanish. The participants were given a passage consisting of 290 sentences, and each sentence had one word starting with either /sl-/ or /st-/. The researcher controlled the environment that preceded the target onsets. The results were 36% epenthesis before /st/ and 25% before /sl/ which indicated a significant difference. Therefore, this study provided evidence confirming that the onsets that violated Sonority Sequencing Principle were more modified than ones that did not violate it.

Another approach of the studies that applied the SSP theory was to determine how the sonority distance between the Cs in the initial consonant cluster plays a significant role in making some patterns of an initial consonant cluster easier than others. This kind of approach can be found in Abrahamsson's (1999) study. He examined two different onset patterns with no violation to the Sonority Sequencing Principle. The researcher focused on fricative + liquid /sl-/, and fricative + nasal /sn-/, which has less sonority distance between them. He found that his participant, who was a native Spanish speaker learning Swedish as a foreign language, modified /sn-/ less frequently than /sl-/. However, the instrument that he used contained only 44 /sl-/ onsets and 67 nasal onsets preceded by /s/. The most significant finding in Abrahamsson's study

was the prothesis that the subject made after a word-final consonant which occurred significantly more frequently than when the onset cluster was after a word-final vowel.

Additionally, Carlisle (1991a) investigated epenthesis in relation to the Sonority Sequencing Principle. In his study, he examined 14 native Spanish speakers' pronunciation of obstruent + nasal /sm/ and /sn/, and the obstruent + liquid /sl/. The participants were asked to read a list of 435 sentences that were unrelated and randomly ordered. The environment that preceded that target onsets was strictly controlled. The subjects' output showed differences in pronouncing the three given patterns. The study revealed that epenthesis occurred 29% for /sl/, 38% for /sm/, and 33% for /sn/. Therefore, the more sonority distance in onset clusters, the less frequent epenthesis the participants had.

This present study was not aimed to follow the first mentioned approach since all the given words were chosen to match the SSP theory system. However, the SSP theory was applied in a way that shows how the sonority distance would affect the presence or frequency of Najdi initial consonant clusters. For example, the results of this study can either support or reject the position that the more distance between the first C and the second C is, the more frequently the initial consonant cluster exists.

2.1.2. Markedness Differential Hypothesis. The Markedness Differential Hypothesis (MDH) plays an important role in modifying the initial consonant cluster along with the SSP hypothesis. According to Eckman (1977), the more marked the sound is, the more difficult it is to acquire it.

In a quantitative study, Eckman (1991) supported this hypothesis by investigating the reduction of complex codas and onsets. Purposely, the researcher chose the Japanese, Cantonese, and Korean languages since they allow neither complex onsets, nor complex codas. In his study,

the participants were 11 native speakers of these three different languages. Eckman looked at the presence and absence of a particular structure instead of looking at when onsets and codas are being modified. This kind of investigation perfectly matches the purpose of the present study since the goal of this paper was not about the Najdi modified initial consonant cluster, but the presence of it. Eckman considered a particular form that is produced correctly 80% of the time by a participant to be an acquired form. For instance, if a participant produced the form /spr/ correctly 80% of the time, the structure was treated as present in the interlanguage phonology. Also, the researcher wanted to determine whether the /sp/ and /pr/ structures are more present than the /spr/ structure or not. Getting a clear result could lead him to confirm the hypothesis that the less marked margins would reach the criterion level before the more marked ones. Based on that, this hypothesis would be refuted if the three-member onsets were present and the two-member ones were absent. However, Eckman faced three falsifications to this hypothesis. Among all the 11 speakers, Eckman found, in three cases, a three-member cluster was produced 80% of the time correctly, whereas a two-member did not reach that level. Although Eckman experienced three falsifications across all the 11 participants, his study does provide very useful evidence for this study's hypothesis. Finally, according to Eckman's study, the less marked cluster would be acquired before the more marked one.

Other researchers have supported the MDH by applying it in their studies. One of these studies, conducted by Anderson (1987), was on the modification of both codas and onsets following the quantitative method. In this study, the researcher took 29 speakers of the Egyptian Arabic dialect and 20 speakers of Amoy and Mandarin Chinese (10 speakers of each language) as the sample in this study. The researcher examined their casual conversion only. This study found that all the participants of these different languages made more modifications of onset and

coda clusters as their length increased. Therefore, Egyptian Arabic speakers kept one-member onsets with no modification. However, they did modify over 7% of two-member onsets. Likewise, Chinese speakers had a similar result to Egyptian speakers in one-member onsets, modifying 1% only, but modified over 10% of the two-member onsets. For each group, the longer onset cluster they had, the more modification they did. The researcher concluded that the relationship between the length of onsets and the frequency of modification, either by deletion or epenthesis, was a statistically significant increase.

To apply the MDH to this study, the /t/ and /s/ should be easier for subjects to articulate as initial consonant clusters than /d/ and /z/, although they are located in the same place and have the same manner of articulation. Also, based on the MDH, the CCV syllable pattern should be more common than CCCV if the subjects have both, which this study aimed to investigate as well.

The MDH and SSP theories mentioned above were combined in this study to show how frequently the more marked initial consonant clusters exist compared to the less marked initial consonant clusters. Similarly, in a study that took five years, Carlisle (1997) applied these two theories. He investigated the hypothesis that less marked onsets are less frequently modified than more marked ones, which is derived from the MDH. This hypothesis was applied on the acquisition of the /.sC(C)/ onsets by native Spanish speaking adults. The researcher focused on the production of two-member onsets /sp/ and /sk/, and three-member onsets /spr/ and /skr/. In this study, Carlisle followed a quantitative methodology. As for the data, it consisted of 176 topically unrelated sentences. These sentences were divided into two sets. The first set contained sentences that have initial consonant clusters that violated the SSP. Taking this pattern of onsets into account was due to previous research results. According to this study, the previous research

determined that the onsets that violate the SSP are modified significantly more than those that do not. As for the second set, it contained sentences that have onset clusters preceded by certain phonological environments because there was research that found that native Spanish speakers use prothesis significantly less frequently after vowels than after consonants and before /.sC(C)/. The study ended up with a result that proved the hypothesis.

2.2. Initial Consonant Cluster in Najdi and Other Arabic Dialects

As mentioned above, Abboud's (1979) study was one of the oldest linguistic papers that discussed the Najdi dialect. Abboud (1979), in his discussion of Najdi verbs, mentioned the lack of linguistic studies that focused on Najdi. Almost thirty years later, Alezetes (2007) still could not find enough studies that investigated the phonology of the Najdi dialect. This section will present studies related to initial consonant clusters in Najdi and other Arabic dialects.

Although Abboud's (1979) paper was about all forms of the strong, final weak, and initial weak Najdi verbs, the initial consonant cluster in Najdi was also briefly observed. The author considered Najdi a unique Arabic dialect due to its frequently occurring consonant cluster. About fifteen years later, Ingham (1994) supported Abboud's claim by considering the admission of initial consonant clusters as one of the phonological features that make Najdi different from Classical Arabic, and the researcher brought /ktabat/ 'she wrote' as an example. Abboud's (1979) study showed that all Najdi syllable patterns must have an onset that has at least one consonant, and this onset cannot have more than one consonant except in word-initial position only. In other words, a Najdi biconsonantal cluster can occur in word-initial position only. Moreover, according to Abboud (1979), three-consonant clusters may occur in word-initial position in Najdi, but this syllable pattern is limited to a few sequences such as /str/. Thus, when three Cs occur in the middle of a word, the syllable boundary should be after the second

consonant; otherwise the biconsonantal onset cluster will occur in the middle of the word which is not allowed in Najdi. However, Abboud stated that his study was not aimed to go further in investigating the consonant cluster since that was not the study's primary goal. As a result, his observation did not take the minimum sonority distance of the initial consonant cluster of Najdi into account.

Almost thirty years later, Alezetes's (2007) study supported Abboud's (1979) findings. In Alezetes's study, Cairene Arabic, Iraqi Arabic, and Najdi Arabic speakers were examined in their production of English complex syllable margins. The speakers' L1 influence was taken into account in order to explore whether the absence or the presence of complex syllable margins in their L1 would affect the speakers' accuracy of producing them in their L2 or not. Alezetes hypothesized that Najdi native speakers should not have difficulty in producing the biconsonantal cluster in word-initial position that occurs in English since they already produced this syllable pattern in their L1. The author relied in his hypothesis on the findings that Abboud (1979) provided in his paper. The author interviewed 22 Saudi men who were native speakers of Najdi Arabic. Via their interviews, the researcher asked them questions that made them produce twelve English words that had biconsonantal clusters in their initial positions. The results showed that there was not a single instance of epenthesis or deletion used to break up the word-initial biconsonantal cluster, which strongly supported Abboud's findings. A lack of knowing the word-initial consonant cluster patterns in Najdi made the researcher not look at the presence patterns of word-initial consonant clusters in Najdi, and how they would play a role in applying them compared to the absence patterns in English.

In several studies that were aimed at investigating Arabic syllabification patterns, such as Abushihab (2010), Watson (2002), and Kiparsky (2003), Arabic dialects were classified

typologically as CV dialects, VC dialects, and C dialects. This classification was made based on the position of the epenthesis that splits CCC, which means that CV dialects insert a vowel to the right of the unsyllabified consonant and VC dialects insert it to the left, whereas C dialects maintain the CCC cluster. However, Alezetes (2007) found that Najdi speakers modified word-medial triconsonantal clusters, which clearly supports the MDH and Abboud's (1979) findings about the word-medial consonant cluster prohibition in Najdi.

Kiparsky (2003) examined 15 Arabic dialects, dividing them based on their types provided above. The CV group included the Cairo, Rosetta, Damietta, ilBaha, Middle Egypt, Upper Egypt to Asyut, and Sharqyya dialects. The VC group included Iraq, Eastern Libya, and three Syrian dialects. The C group included Tunisia and the Southern Saudi Arabian dialect. In this study, the researcher mainly focused on syllabification patterns in these three dialect groups. The purpose of his study was to argue that these three types of dialect differ in the licencing of semisyllables. When the researcher was examining the differences among these three types of dialect using a table containing 16 words, he found that the VC and C dialects allow initial consonant clusters due to the high vowel deletion in open syllables. His finding shows that the Southern Saudi Arabian dialect, which is close to the Najdi dialect compared to the other dialects he studied, have initial consonant clusters. For example, he found, in C and VC dialects, the word /ktaab/ 'book' with no vowel between /k/ and /t/ while other dialects that he observed have a short vowel that breaks the cluster. However, the researcher did not mention how many participants he had. Also, there was no statistical analysis since the framework of Optimality Theory was used.

According to Daana (2009), although Classical Arabic allows no initial consonant cluster, there are some Arabic dialects that do have initial consonant clusters, namely Palestinian,

Damascene, Cairene, Hebrew, and Ammani Arabic. Moreover, the author mentioned the presence of this phonological feature, the existence of initial consonant clusters, in the Ammani Arabic dialect as a fact (not as a matter she wanted to make sure of) since the purpose of her study was to provide an account of the acquisition of consonant cluster, stress and plural nouns by children learning Ammani Arabic. Before Daana analyzed the results of her study, she defined the initial consonant clusters that appear in Ammani Arabic as clusters that can happen regardless of the SSP restrictions. Therefore, in Ammani Arabic, there are complex onsets that obey the SSP, and there are others that flout it. The author illustrated this by providing two words, /traab/ 'soil' and /rfuuf/ 'shelves', where the consonant sequence in the first word follows the SSP rules and it does not in the second one. Furthermore, Daana presented two examples that show that Ammani Arabic has three-consonant onset patterns but the first two consonants have to be a geminate and the third one has to be more sonorous than them, as in the word /sswadd/ 'became black'.

Daana (2009) tested her study's subjects with a total of 100 Arabic words that can answer all her research questions, where 11 words of them were preserved for testing the acquisition of onset clusters. The researcher distributed the chosen 11 words as follows:

- A liquid followed by a fricative as in /rf-/
- A nasal followed by a glottal stop as in /mʔ-/
- A stop followed by a fricative as in /kf-/
- A nasal followed by a fricative as in /mʕ-/
- A stop followed by another stop as in /kt-/
- A fricative followed by another fricative as /ħs-/
- A fricative followed by a nasal as in /ʒm-/

- A nasal followed by a liquid as in /mr-/
- A stop followed by a liquid as in /tr-/, and /kl-/.
- A stop followed by a glide as in /bw-/.

According to the list above, the author introduced some words that have onset clusters with no violation to the SSP as in /kf-/, /ʒm-/, /mr-/, /tr-/, and /kl-/, and /bw-/, and some words that have onset clusters with a violation to the SSP as in /rf-/, /mʔ-/, /mʕ-/, /kt-/, and /ħs-/. Although the researcher used these words to test the onset clusters acquisition of different children groups from the two-year-old group to the seven-year-old group, their productions can show how those children treated or modified the onset clusters that occur in an Arabic dialect where it is prohibited in their standard language.

Interestingly enough the researcher ended up with results that show no role of the SSP in acquiring onset clusters for the early age groups. For example, it was expected that the consonant clusters that have more sonority distance between them (as in /bw-/) are easier than those which have less sonority distance (as in /kf-)/ or violate the SSP (as in /rf-/) based on the assumption that the least marked is acquired first. However, the two-year-old group performed better in producing /mraaje/ ‘mirror’ and /ħsaan/ ‘horse’ than in /bwaab/ ‘doors’. Also, the results showed that in older groups the subjects tended to break onset clusters by either prothesis or epenthesis but not deletion where the SSP played a role in this process. At the end, the author discussed her study’s findings by saying that sonority distance did play a role in acquiring onset clusters in general, except for the sequences /mr-/ and /ħs-/ since they were easier than /tr-/, /kl-/, and /bw-/.

Although there are some studies that showed the presence of onset clusters in Arabic dialects, there are some others which argue that onset clusters are prohibited in both Classical Arabic and many of its variations. Aljumah (2008) discussed the syllable structure of the Al-

Ahsa dialect, which is one of the Arabic variations spoken in the eastern region of Saudi Arabia. According to Aljumah, the Al-Ahsa dialect inhibits complex onsets and initial geminates just as in many Arabic dialects, which retain the Classical Arabic phonological feature in this particular position. Haddad (2005) stated that there is no difference between the Cairene dialect and Modern Standard Arabic at the left edge of the word; thus both of them allow no onset clusters. Likewise, Archibald (2003) agreed that there is no initial consonant cluster in the Cairene dialect. Furthermore, Gafos (2003) argued that since geminates are allowed in Arabic but not in onsets; thus no onset cluster is allowed in Arabic. Gafos, Shaw, Hoole, and Zeroual (2011) indirectly stated that all Arabic dialects disallow initial consonant cluster by saying Moroccan is claimed to inhibit complex onsets just like other Arabic dialects.

2.3. Prothesis

In linguistic fields, prothesis is the addition of a phoneme or syllable at the beginning of a word. As a native speaker of Najdi, when Najdi native speakers delete the nucleus of the first syllables, I assume that a prothesis process might be employed to avoid word-initial consonant clusters in some cases. These cases can be determined after analyzing the subjects' productions in the current study. Arabic speakers have been known to insert an initial vowel or a glottal stop followed by a short vowel as a repair tool to avoid disallowed onsets in Classical Arabic.

Haddad (2005) brought up the case of imperative verbs as a good instance of prothesis phenomena in Classical Arabic. Morphologically, some imperative verbs of Classical Arabic are supposed to begin with a consonant cluster such as /ʃrab/ 'drink-IMP' and /drus/ 'study- IMP'. However, when speaking Classical Arabic, Arabic speakers repair the complex onset via ʔV, which makes the two aforementioned verbs realized as /ʔiʃrab/, and /ʔudrus/. Haddad (2005) addressed the prothesized glottal stop in these verbs as a last-resort repair strategy. Therefore, the

glottal stop would not be needed if the verb were preceded by a word that has a final closed syllable, since the final coda of the former word will replace the glottal stop. For example, /qum drus/ ‘go study’ (literally, ‘rise study’) is realized as [qu.mud.rus]. This technique of using a prothesis process in some Arabic imperative verbs might be applied in the same way in the Najdi dialect when the first syllable nucleus deletion occurs.

2.4. Vowel Deletion

In this study, all the expected onset clusters will be a result of vowel deletion that exists in Classical Arabic pronunciation. Vowel deletion has been observed in many languages to figure in phonological effects, and the initial consonant cluster is one of the effects that vowel deletion could cause. Glowacka (2001) examined the relationship between unstressed vowel deletion and consonant cluster in English. Glowacka asked 19 British students aged between 20 and 30 to read 39 English sentences containing different contexts for unstressed vowel deletion. The researcher found that vowels were mostly deleted when they occurred between two voiceless obstruents (e.g. *suppose, suspense, potential*). Also, the researcher found that the number of deletions dropped rapidly when the obstruents surrounding the vowel were voiced. Glowacka’s experiment showed how the type of vowel could play a sufficient role in creating a new consonant cluster.

Classical Arabic has six vowels; three of them are long which are /u:/, /i:/, and /a:/, and the other three are short which are /u/, /ɪ/, and /ə/. These 6 vowels appear clearly in Classical Arabic pronunciation and in its writing system, except in some cases. For example, the word /haða/ ‘this’ is written as (hða). In addition, when speaking Classical Arabic there are some vowels that must be deleted in certian environments due to grammatical rules. For instance, the verb /yamshi:/ ‘walk’ must turn to /yamsh/ when it is preceded by the item of negation (as well

as deletion) /lam/ ‘did not’ (Al Hammadi, Luwa, & Yaari, 2012). Therefore, there are some studies that focused on the additional cases of vowel deletion that occur in some Arabic dialects to investigate whether or not those cases cause or affect consonants’ segmentation and/or consonant clusters. Al Hammadi, Luwa, and Yaari (2012) conducted a study to examine whether Yemeni people delete vowels in their dialects or not. The researchers found that all Arabic dialects of Yemen, except the Aden dialect, delete short vowels in some cases. Moreover, they found some new consonant clusters in Yemeni dialects as a result of vowel deletion that occurred between the phonemes /l/ and /s/, /z/ and /ʕ/, /q/ and /t/, and /m/ and /s/. The researchers confirmed that these new clusters do not exist in Classical Arabic since the deleted vowel must be orally and orthographically mentioned between the aforementioned phonemes.

CHAPTER 3

METHODOLOGY

3.1. Statement of the Problem

The goal of this study was to investigate the patterns of word-initial consonant clusters in Najdi Arabic and measure the sonority scale of this particular position.

3.2. Research Methodology

The methodology of this study mostly followed the quantitative method of data collection and analysis. However, this study followed the qualitative method in some sections since it was an exploratory study. To be more specific, this study used the quantitative method to analyze the output. However, it was under the qualitative framework since the study built its own hypothesis and let the data speak to determine the independent variable.

3.3. Research Questions and Hypothesis

1- Does the Najdi dialect have initial consonant clusters? If so, what patterns of initial consonant cluster does it have?

2- In what consonant environment is the nucleus deleted?

3- What is the minimum sonority distance of the initial consonant cluster of the Najdi dialect?

4- How frequently do the more marked initial consonant clusters exist compared to the less marked initial consonant clusters?

As mentioned above, this study carries a hypothesis that the Najdi dialect has word-initial consonant clusters as a historical change that makes it differ from the Classical Arabic language syllable structure. The researcher built this hypothesis when he noticed the existence of word-

initial consonant clusters in his native dialect pronunciation, which is Najdi. However, this study was not aimed to investigate how and when the change process happened, but instead where the change happened in the target dialect.

3.4. Variables

The independent variable of this study was the figured environment/s that cause/s word-initial consonant cluster in the Najdi dialect, whereas the dependent variable was the production of initial consonant cluster in the target dialect.

3.5. Participants

The participants of this study consisted of 10 native speakers of Najdi, whose ages were between 18 and 30 years old. In this study, the females and males were divided equally in order to control the effect of gender. Roughly, the participants had the same level of education; the lowest level was a university undergraduate and the highest level was a university graduate student. Furthermore, all the participants had received at least a high school degree in a school that uses Classical Arabic language as a primary language in all subjects, to make sure that they can speak both varieties: Classical Arabic and Najdi. Likewise, the participants represented different social classes to control partially for socio-economic influence on their pronunciation. Their social classes were known by asking them in which neighborhood they were raised in the central region of Saudi Arabia. The study aimed to have data that represents the Najdi speakers' way of speech in general. Therefore, the study tried to control the variables of the participants instead of having their variables act as variables of interest.

3.6. Instrument

The instrument of the current study consisted of 24 Arabic words and 24 sentences. The subjects were asked to read them aloud, and told that their voices will be recorded and analyzed.

Each one of the subjects was recorded individually after agreeing and signing a consent form to participate in this study. Prior to examining the subjects, demographic information was collected through a questionnaire that asked about educational status, age, gender, and city of origin. After that, the subjects started to read each word twice; one time individually and the other in a sentence to see if fluent speech plays a role in producing an onset cluster or not. In addition, the subjects were not told about what the investigator was focusing on exactly, because once they realized that they might follow the Classical Arabic way of pronunciation subconsciously. However, the participants were asked to read the words and sentences as they would pronounce them in casual speech. Additionally, before the researcher started recording the participants' voices, he held an informal conversation with them using the Najdi dialect so they could comfortably shift their formal register to the Najdi one.

The 24 words were selected based on the sonority slope of their onsets and codas. As explained initially, those onsets and codas were expected to behave as initial consonant clusters in Najdi due to nucleus deletion, CVC. However, the expected onset cluster could be a combination of two single onsets that belong to different syllables in the Classical Arabic language syllable structure, (CV.CV). Therefore, the 24 Arabic words were selected in a way that made them meet all possible Arabic initial consonant cluster patterns that could occur in the target dialect, taking the voiced and voiceless sounds into account (see Table 2).

Table 2

Initial Consonants Cluster Patterns Classification

Cluster Pattern	Arabic Word	English Translation	IPA Transcription
-VS+-VF	تسامح	forgiveness	/tasamʊħ/
VS+VF	بذور	seed	/bʊður/
-VF+VN	حمار	donkey	/ħɪmar/
VF+VN	ذنوب	sins	/ðunub/
VN+VL /r/	مريض	sick	/maridˤ/
VN+VL /l/	ملاك	angel	/mələk/
VL+VG /w/	رواية	novel	/rɪwajah/
VL+VG /j/	رياضة	sport	/rɪjadˤah/
-VS+VN	تنادي	she calls	/tʊnadi/
VS+VN	دماء	blood	/dɪmaʕ/
-VF+VL	سلام	peace	/səlam/
VF+VL	زراعة	agriculture	/zɪraʕəh/
VN+VG /w/	موافق	agree	/muwafɪq/
VN+VG /j/	مياه	water	/mɪjah/
-VS+VL	تراب	soil	/tʊrab/
VS+VL	دليل	evidence	/dalil/
-VF+VG	ثياب	dresses	/θɪjab/
VF+VG	زواج	wedding	/zawadʒ /
-VS+VG	قوارب	boats	/qawarb/

"Table 2 (Continued)"

Cluster Pattern	Arabic Word	English Translation	IPA Transcription
VS+VG	دوام	stability	/dawam/
-VS+VL+VG	قلوة	Saudi village name	/qɪlwah/
VS+-VF+VL	بشرى	good news	/boʃra/
-VF+VL+VG	ثروة	wealth	/θərwah/
VN+VL+VG	مروة	Arabic female name	/mərwəh/

Note. V=voiced, -V=voiceless, S=stop, F=fricative, N=nasal, L=liquid, and G=glide.

The pronunciation of these 24 words individually and in sentences by the participants can answer all the study questions since they can show in which environment the vowel deletion occurs. They can show whether the vowel is deleted when it is followed by one consonant, which results in a CC onset cluster pattern, or when it is followed by two consonants, which results in a CCC onset cluster pattern, or both of them. Also, those words can show how many sonority distance steps the subjects allow in word-initial consonant clusters, and the effect of the markedness level of each word in making a consonant cluster.

3.6. Analyses of the Data

The recorded data was analyzed through Speech Analyzer software to determine whether the subjects pronounce the given words with initial consonant clusters or not. Focusing on where vowel formants are located in the spectrogram can clearly indicate whether the subjects pronounce the first syllable of the given words as (CVC) or (CCV). Vowels usually have three distinctive formants that differ from consonant ones, which clearly appear as dark bands on a spectrogram. However, these formants can be short or long, and can be high or low based on the vowel position.

If the subjects produce the given words as their actual pronunciation in Classical Arabic, that means they will maintain the first vowel between the first two consonants in each word. However, if they delete the vowel they would either avoid a disallowed onset cluster by adding a prothesized vowel as repair tool or allow an onset cluster in their dialect. The researcher pronounced /ħımar/ ‘donkey’ three times; the first time with vowel (see Figure 1), the second time with a prothesis (see Figure 2), and the third time with an onset cluster to see how they look in spectrograms (see Figure 3). The three distinctive formants of vowel can be seen in Figures 1 and 2.

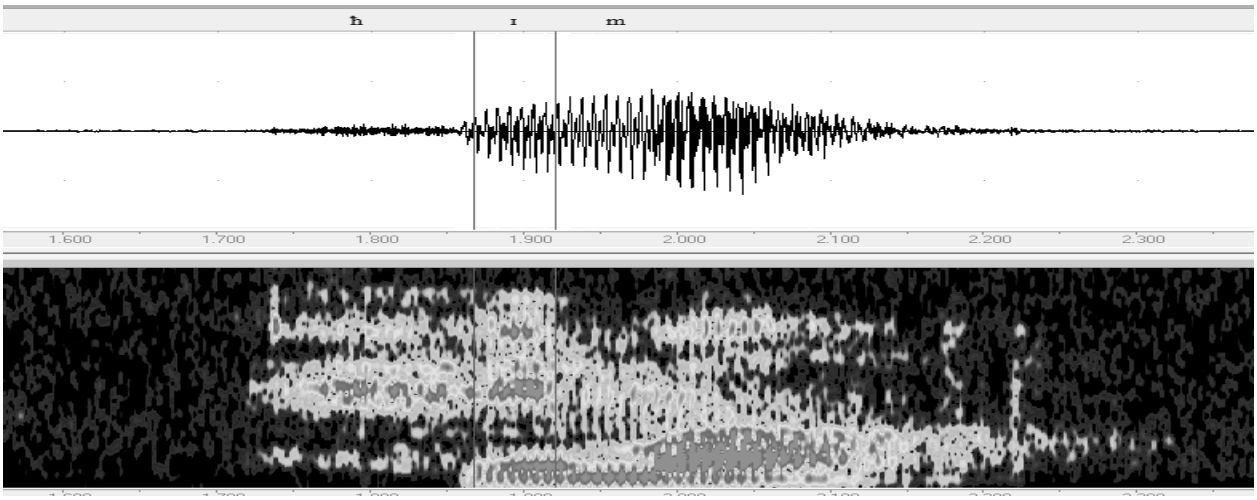

Figure 2. /ħımar/ ‘donkey’ with a vowel.

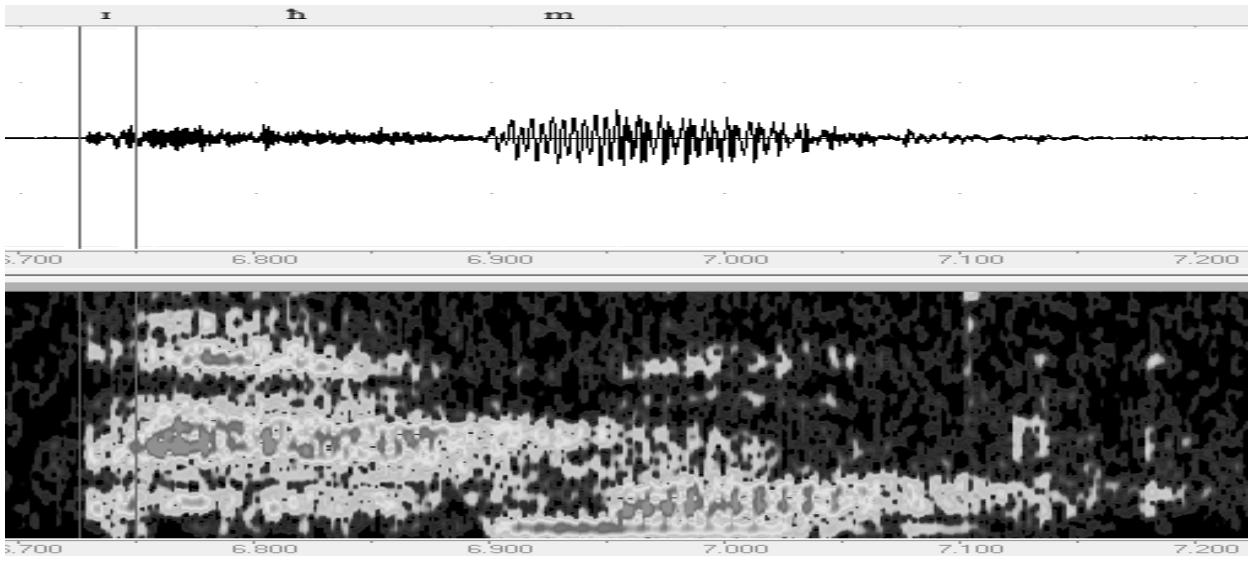

Figure 3. /ħɪmar/ ‘donkey’ with a prothesis.

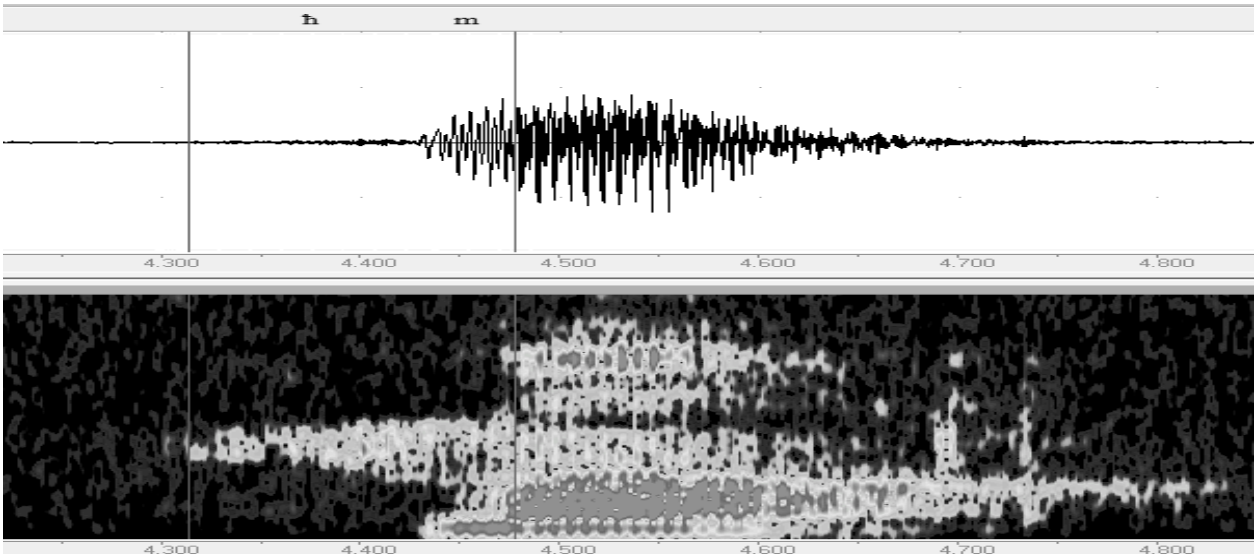

Figure 4. /ħɪmar/ ‘donkey’ with an initial consonant cluster.

In scoring the data, for each word’s production, a checkmark was used to mark one of three production patterns that the subjects produced. These three patterns were the Classical Arabic pattern (Figure 2), the word-initial consonant cluster pattern (Figure 4), and the prothesis pattern (Figure 3).

Since the independent variable is not clear yet (more than one particular environment may cause an initial consonant cluster) the study will use percentages to reflect the frequency of each pattern. In the case of pronouncing an initial consonant cluster by more than 50% of the participants, the pattern of that cluster they produced will be considered as an existent initial cluster in Najdi.

CHAPTER 4

RESULTS

The present study was aimed at investigating the word-initial consonant cluster patterns in the Najdi dialect spoken in the central region of Saudi Arabia. In this study, there were 10 subjects, who were raised in a Najdi town and had received at least a high school degree in a school that used Classical Arabic as a primary language in all subjects. They were asked to speak 24 words using the Najdi pronunciation. The verbal productions of those 10 subjects, described in detail in the previous chapter, show the differences between Classical Arabic and Najdi in terms of how speakers deal with word-initial consonant clusters, which are in all cases disallowed in Classical Arabic.

This chapter includes tables that display the results of the subjects' productions of the 24 words, each of which were produced twice, the first time individually and the second time in sentences. This chapter analyzes the word-list productions first, then it compares them all with those words pronounced in sentences to see whether there is a difference between them. Those 24 words contain all the possible consonant cluster patterns that occur in Najdi. The following tables use percentages to show how frequently each word was produced with a word-initial consonant cluster, with epenthesis, and with prothesis. All the words that share some common characteristics, namely, sonority distance between first and second consonants, markedness level, and number of onsets in the cluster, are grouped together in order to compare them with each other and with other groups as well. Furthermore, there are three tables, one combining the words that were mostly pronounced with word-initial consonant clusters, one with epenthesis,

and one with prothesis. This method of grouping the words helps in answering all the present study's questions in a clear way.

Table 3

Words with One Sonority Distance Step Between Their First Two Cs

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-Like	Prothesis Process
-VS+-VF	تسامح	forgiveness	/tasamʊħ/	80%	20%	0%
VS+VF	بذور	seed	/bʊður/	90%	10%	0%
-VF+VN	حمار	donkey	/ħɪmar/	80%	0%	20%
VF+VN	ذنوب	sins	/ðunub/	80%	0%	20%
VN+VL /r/	مريض	sick	/maridˤ/	0%	100%	0%
VN+VL /l/	ملاك	angel	/mələk/	0%	100%	0%
VL+VG /w/	رواية	novel	/rɪwajah/	100%	0%	0%
VL+VG /j/	رياضة	sport	/rɪjadˤah/	100%	0%	0%

Note. V=voiced, -V=voiceless, S=stop, F=fricative, N=nasal, L=liquid, and G=glide.

The eight words shown in Table 3, which have one sonority distance step between their first and second Cs, were pronounced mostly with a word-initial consonant cluster except in /maridˤ/ 'sick' and /mələk/ 'angel'. All of the subjects pronounced these two words in the Classical Arabic manner, where the nucleus of the first syllable was preserved. However, the nuclei of the first syllable of the other six words were mostly deleted. This kind of deletion resulted in a word-initial consonant cluster in those six words. Only 20% of the subjects deleted the nucleus of the first syllable in /ħɪmar/ 'donkey' and /ðunub/ 'sins' but avoided an initial onset cluster through the process of prothesis, by putting the nucleus that comes after the first onset in front of that cluster. Thus, [ħɪmar] and [ðunub] were pronounced as [ɪħmar] and [uðnub].

Table 4

Words with Two Sonority Distance Steps Between Their First Two Cs

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-Like	Prothesis Process
-VS+VN	تنادي	she calls	/tɒnadi/	100%	0%	0%
VS+VN	دماء	blood	/dɪmaʕ/	0%	100%	0%
-VF+VL	سلام	peace	/səlam/	10%	90%	0%
VF+VL	زراعة	agriculture	/zɪraʕəh/	100%	0%	0%
VN+VG /w/	موافق	agree	/muwafɪq/	100%	0%	0%
VN+VG /j/	مياه	water	/mɪjah/	100%	0%	0%

Note. V=voiced, -V=voiceless, S=stop, F=fricative, N=nasal, L=liquid, and G=glide.

Table 4 reveals how the participants pronounced the six words that have two sonority distance steps between their first two Cs. All the participants pronounced four of those six words with a word-initial consonant cluster as a result of nucleus deletion. The remaining two words were /dɪmaʕ/ ‘blood’ and /səlam/ ‘peace’, and pronounced just as they would be in Classical Arabic. However, /dɪmaʕ/ ‘blood’ was pronounced in the Classical Arabic way of pronunciation by 100% of the participants whereas /səlam/ ‘peace’ was pronounced in the Classical Arabic way of pronunciation by 90% of the participants, and with an onset cluster by 10% of them. There was no single instance of a prothesis process in any of the six words that have two sonority distance steps between their first two Cs.

Table 5

Words with Three Sonority Distance Steps Between Their First Two Cs

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-Like	Prothesis Process
-VS+VL	تراب	soil	/tʊrab/	100%	0%	0%
VS+VL	دليل	evidence	/dalil/	0%	100%	0%
-VF+VG	ثياب	dresses	/θɪjab/	100%	0%	0%
VF+VG	زواج	wedding	/zawadʒ /	30%	70%	0%

Note. V=voiced, -V=voiceless, S=stop, F=fricative, L=liquid, and G=glide.

Table 5 displays the way of pronouncing the first two Cs of the four words that have three sonority distance steps between their first two Cs. All the participants pronounced /tʊrab/ 'soil' and /θɪjab/ 'dresses' with a word-initial consonant cluster, whereas only 30% of them pronounced /zawadʒ / 'wedding' with a word-initial consonant cluster. However, 100% of the participants pronounced /dalil/ 'evidence', and 70% of them pronounced /zawadʒ / 'wedding' with a vowel between the first two Cs, which means that they followed the Classical Arabic rules in these two words. None of the four words that have three sonority distance steps between their first two Cs were pronounced with prothesis.

Table 6

Words with Four Sonority Distance Steps Between Their First Two Cs

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-Like	Prothesis Process
-VS+VG	قوارب	boats	/qawarb/	0%	100%	0%
VS+VG	دوام	stability	/dawam/	20%	80%	0%

Note. V=voiced, -V=voiceless, S=stop, and G=glide.

As can be seen in Table 6, the first nucleus of the two words that have four sonority distance steps between their first two Cs was preserved by most of the subjects' pronunciations. All of the subjects pronounced /qawarb/ 'boats' as it would be pronounced in Classical Arabic. Slightly fewer speakers, 80% of the subjects, pronounced the second word, /dawam/ 'stability' in the Classical Arabic pronunciation while 20% of them pronounced it with an onset cluster. There was no prothesis process employed in these two words.

Table 7

Words That Have Two Cs after Their First Nucleus

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-Like	Prothesis Process
-VS+VL+VG	قلوة	city name	/qɪlwah/	0%	100%	0%
VS+-VF+VL	بشرى	good news	/bʊʃra/	0%	100%	0%
-VF+VL+VG	ثروة	wealth	/θərwah/	0%	100%	0%
VN+VL+VG	مروة	name	/mərwəh/	0%	100%	0%

Note. V=voiced, -V=voiceless, S=stop, F=fricative, N=nasal, L=liquid, and G=glide.

Table 7 includes the four words that would result in three-member onset clusters if their first nucleus were deleted since they have two Cs after their first nucleus. However, all of the subjects pronounced these four words in the Classical Arabic pronunciation, which means that they maintained all of the four words' first nuclei in Najdi. Thus, there was no instance of a word-initial consonant cluster or prothesis in these four words. However, if there was any instance of initial cluster in these four words, that means this cluster would be the most marked one compared to the other since it would have a three-member onset cluster.

In the following tables, the 24 words are divided into three groups based on their level of markedness. The first group contains the words that have initial clusters that are generally less marked than the other two groups since the first onset member is an obstruent in all of them. The second group contains the words that have initial consonant clusters that are generally more marked than the first group and less marked that the third one, and all the initial clusters in this group start with a sonorant. The third group, which is already presented in Table 7, contains the words that have the most marked initial clusters, in the case of deleting the first vowel, compared to the other two groups, since the words that the third group includes have three-member onset clusters.

Table 8

Words that Have obstruent-initial Clusters in the Case of Deleting the First Vowel

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-Like	Prothesis Process
obs+G	ثياب	dresses	/θɪjab/	100%	0%	0%
obs+G	زواج	wedding	/zawadʒ /	30%	70%	0%
obs+G	قوارب	boats	/qawarb/	0%	100%	0%
obs+G	دوام	stability	/dawam/	20%	80%	0%
obs+N	حمار	donkey	/ħɪmar/	80%	0%	20%
obs+N	ذنوب	sins	/ðunub/	80%	0%	20%
obs+N	تنادي	she calls	/tʊnadi/	100%	0%	0%
obs+N	دماء	blood	/dɪmaʕ/	0%	100%	0%
obs+L	سلام	peace	/səlam/	10%	90%	0%
obs+L	زراعة	agriculture	/zɪraʕəh/	100%	0%	0%
obs+L	تراب	soil	/tʊrab/	100%	0%	0%
obs+L	دليل	evidence	/dalil/	0%	100%	0%

Note. obs=obstruent, G=glide, N=nasal, and L=Liquid.

As seen in Table 8, all the 12 word-initial consonant clusters above begin with an obstruent, which is generally less marked than all the clusters that start with a sonorant. Six of the 12 words above were mostly pronounced with a word-initial cluster whereas the other six words were mostly pronounced with a one-member onset as they are in the Classical Arabic pronunciation.

The four words that start with obstruent followed by liquid pattern, which is considered to be the least marked pattern among this group, two of them were pronounced with a word-

initial cluster, and these two are the ones that have /r/ as a second member of the cluster. However, the other two words which have /l/ as a second consonant were pronounced as they are in Classical Arabic which means that the vowel preceding /l/ was preserved.

Also, the words that start with obstruent followed by nasal pattern, which is considered to be the mid marked pattern among this group, were pronounced with a word-initial cluster except for one word, which is /dɪmaʕ/ 'blood'.

In contrast, three out of four words that start with obstruent followed by glide were pronounced with a vowel in between since this pattern (obstruent + glide) is considered to be the most marked one among this group. Thus, only one word was pronounced with a word-initial consonant cluster, which is /θɪjab/ 'dresses'.

Table 9

Words That Have sonorant-initial clusters in the Case of Deleting the First Vowel

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-Like	Prothesis Process
L+G	رواية	novel	/rɪwajah/	100%	0%	0%
L+G	رياضة	sport	/rɪjadˤah/	100%	0%	0%
N+G	موافق	agree	/muwafɪq/	100%	0%	0%
N+G	مياه	water	/mɪjah/	100%	0%	0%
N+L	مريض	sick	/maridˤ/	0%	100%	0%
N+L	ملاك	angel	/mələk/	0%	100%	0%

Note. L=liquid, G=Glide, and N=nasal.

As seen in Table 9, all the words start with sonorants. The four words that have a glide as a second consonant were pronounced with a word-initial cluster by all of the subjects. However,

the two words that have liquid as a second consonant were pronounced with a vowel between their first two consonants by all the subjects whether the liquid phoneme is /l/ or /r/.

Table 10

Words Mostly Pronounced with a Word-Initial Consonant Cluster

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Word-initial Cluster
-VS+-VF	تسامح	forgiveness	/tasamʊħ/	80%
VS+VF	بذور	seed	/bʊður/	90%
-VF+VN	حمار	donkey	/ħɪmar/	80%
VF+VN	ذنوب	sins	/ðunub/	80%
VL+VG /w/	رواية	novel	/rɪwajah/	100%
VL+VG /j/	رياضة	sport	/rɪjadˤah/	100%
-VS+VN	تنادي	she calls	/tʊnadi/	100%
VF+VL	زراعة	agriculture	/zɪraʕəh/	100%
VN+VG /w/	موافق	agree	/muwafɪq/	100%
VN+VG /j/	مياه	water	/mɪjah/	100%
-VS+VL	تراب	soil	/tʊrab/	100%
-VF+VG	ثياب	dresses	/θɪjab/	100%

Note. V=voiced, -V=voiceless, S=stop, F=fricative, N=nasal, L=liquid, and G=glide.

As can be seen in Table 10, most of the subjects pronounced 12 out of the 24 words with a word-initial consonant cluster. All these 12 different initial clusters were the result of the deletion of the nucleus that exists in the Classical Arabic pronunciation. None of the 12 word-initial consonant clusters formed an onset with more than two members. By looking at each

initial cluster that the subjects produced, the consonant environment of nucleus deletion can be determined in Najdi.

Table 11

Words Mostly Pronounced As They Would Be Spoken in the Classical Arabic Pronunciation

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Classical Arabic-Like
VN+VL /r/	مريض	sick	/marid^{ɛ}/	100%
VN+VL /l/	ملاك	angel	/məlak/	100%
VS+VN	دماء	blood	/dɪmaʕ/	100%
-VF+VL	سلام	peace	/səlam/	90%
VS+VL	دليل	evidence	/dalil/	100%
VF+VG	زواج	wedding	/zawadʒ /	70%
-VS+VG	قوارب	boats	/qawarb/	100%
VS+VG	دوام	stability	/dawam/	80%
-VS+VL+VG	قلوة	Saudi village name	/qɪlwah/	100%
VS+-VF+VL	بشرى	good news	/bʊʃra/	100%
-VF+VL+VG	ثروة	wealth	/θərwah/	100%
VN+VL+VG	مروة	Arabic female name	/mərwəh/	100%

Note. V=voiced, -V=voiceless, S=stop, F=fricative, N=nasal, L=liquid, and G=glide.

Table 11 combines all the words that the subjects pronounced as they would be spoken in the Classical Arabic pronunciation. The vast majority of the subjects preserved the first nucleus,

which exists in Classical Arabic pronunciation, in the Najdi pronunciation in 12 words. These 12 words have different numbers of sonority distance steps between their first two Cs. Also, all the subjects produced the first nucleus of the four words that would result in a three-member onset cluster if their first nucleus were deleted.

Table 12

Words That Were Pronounced with Prothesis

Consonant Pattern	Arabic Word	English Translation	IPA Transcription	Prothesis Process
-VF+VN	حمار	donkey	/ħɪmar/	20%
VF+VN	ذنوب	sins	/ðunub/	20%

Note. V=voiced, -V=voiceless, F=fricative, and N=nasal.

As can be seen in Table 12, 20% of the subjects used prothesis as a repair tool to avoid onset clusters in /ħɪmar/ ‘donkey’ and /ðunub/ ‘sins,’ which were produced as /ɪħmar/ and /uðnub/.

Table 13

Words That Were Produced Differently When Appearing in Sentences than When Appearing in a List of Words

IPA Transcription	Word-initial Cluster		Classical Arabic-Like		Prothesis Process	
	In a list	In a sentence	In a list	In a sentence	In a list	In a sentence
/ħımar/	80%	40%	0%	0%	20%	60%
/səlam/	10%	40%	90%	60%	0%	0%
/muwafıq/	100%	20%	0%	0%	0%	80%
/mıjah/	100%	90%	0%	0%	0%	10%
/zawadʒ/	30%	0%	70%	100%	0%	0%

All the tables presented above reveal the subjects' productions of the 24 individual words. However, Table 13 grouped all the words that were produced differently when they were in sentences than when they were alone. As seen from Table 13, there were five words that were pronounced in a different way in a sentence. The five words, which were /ħımar/ 'donkey,' /səlam/ 'peace,' /muwafıq/ 'agreed,' /mıjah/ 'water,' and /zawadʒ / 'wedding,' were influenced by fluent speech. The number of the subjects who prothesized /ħımar/ increased from 20% to 60% when they pronounced it in a sentence, which means that the majority of the subjects added a vowel in front of the word as a result of deleting the first nucleus. In contrast, the number of the subjects who pronounced /səlam/ with an initial vowel nucleus decreased from 90% to 60% when it was in a sentence. However, the number still represents the majority. As for /muwafıq/, which was pronounced by all the subjects with a word-initial consonant cluster when it appeared

alone, only 20% of the subjects treated it that way when it was in a sentence, whereas the remaining 80% prothesized the word. The word /mɪjah/ was pronounced with a word-initial consonant cluster by all the subjects when it appeared alone. However, 10% of the subjects used prothesis to divide the cluster into two different syllables when the word appeared in a sentence. No change occurred in /zawadʒ/ when it was pronounced in a sentence; however, 30% of the subjects deleted its first nucleus when it was pronounced alone.

CHAPTER 5

DISCUSSION, LIMITATIONS AND CONCLUSIONS

As was stated above, the goal of this study was to investigate the patterns of word-initial consonant clusters in the Najdi dialect and measure the sonority scale of this particular position. Based on the results provided in chapter four, this chapter answers the study questions, each in a separate section, and compares the findings of this study with the other related studies presented in chapter two. The main goal of this chapter is to present the sonority scale of word-initial consonant clusters in the Najdi Arabic.

5.1. Question One: Does the Najdi Dialect Have Initial Consonant Clusters? If So, What Patterns of Initial Consonant Clusters Does It Have?

The answer to the first part of the question would be yes since the findings of this study revealed the existence of word-initial consonant clusters in Najdi (see Table 10), which clearly supports the hypothesis of this study. Finding this phonological feature in a dialect derived from Classical Arabic, in which initial consonant clusters were entirely absent, brings strong evidence that the phonological systems of Classical Arabic and its dialects differ.

The results of the current study support the claim made by Abboud (1979). Briefly, Abboud (1979) considered Najdi a unique Arabic dialect due to its frequently occurring consonant cluster in the initial position. In addition to Abboud (1979), Ingham (1994) and Alezetes (2007) mentioned the existence of the feature of word-initial consonant clusters in Najdi. However, none of them investigated in which environments consonant clusters occur in Najdi. Furthermore, this study supported Abboud's (1979) claim about triconsonantal clusters in Najdi when it found that there is no single instance of a three-consonant cluster in the subjects'

production, which means that the biconsonantal cluster is the only initial cluster pattern that occurs in Najdi (see Table 7). Furthermore, based on the present study's findings, Najdi is one of the Arabic dialects that allow initial consonant clusters, including Southern Saudi, Palestinian, Damascene, Cairene, Hebrew, and Ammani Arabic dialects as they were described in Daana (2009) and Kiparsky (2003).

Although the study supports some earlier research findings regarding this matter, it disagrees with some of them as well. Aljumah (2008), Archibald (2003), Haddad (2005), and Gafos, Shaw, Hoole, and Zeroual (2011) discussed different Arabic dialects, and concluded that Arabic dialects in general and/or the particular dialects they studied disallow initial consonant clusters since geminates are allowed in Arabic but not in onsets.

In this study, 12 out of 24 words were mostly pronounced with a word-initial consonant cluster (see Table 10). The initial clusters that the subjects produced differed in their manner of articulation. For example, the manner of articulation of the first two consonants in /ħmar/ differed than those in /tnadi/.

Looking at all the environments where the clusters occurred reveals the patterns of initial consonant clusters in Najdi. Based on the findings presented in Table 10, initial consonant clusters were allowed in the following environments:

- Stop followed by fricative
- Fricative followed by nasal
- Liquid followed by glide
- Stop followed by nasal
- Fricative followed by liquid
- Nasal followed by glide

- Stop followed by liquid

In contrast to the list above, the word-initial consonant clusters were mostly not found in the following environments:

- Nasal followed by liquid
- Fricative followed by glide
- Stop followed by glide

5.2. Question Two: In What Consonant Environment Is the Nucleus Deleted?

Basically, the environments where the word-initial consonant clusters occurred were the same environments where the first nucleus was usually deleted, since the clusters happened as a result of vowel deletion. In contrast to Glowacka (2001), who found that syncope mostly happened between two voiceless obstruents, this specific environment was not a critical factor in the present study. The first vowel was mostly deleted in words such as /tasamʊħ/, which falls between two voiceless obstruents, as well as in /bʊður/, where the vowel falls between two voiced obstruents. In addition, first vowel deletion was found in many words that do not even begin with an obstruent such as in /muwafɪq/. As a result, looking at the manner of articulation of the first two consonants of a word and the role of the SSP was the best way to illustrate the deletion of the first vowel in Najdi. On the other hand, the length and type of the deleted vowel may have played a role, which is discussed later in this chapter.

Finally, the deletion of the first vowel in Najdi caused a word-initial consonant cluster in the seven consonantal environments listed above. Similarly, Al Hammadi, Luwa, and Yaari (2012) found initial consonant clusters in all Arabic dialects of Yemen as a result of short vowel deletion, with the exception of the Aden dialect. Likewise, the authors confirmed that first vowel deletion does not occur in Classical Arabic; thus initial consonant clusters appeared in later

dialects. However, the environments of vowel deletion that Al Hammadi, Luwa, and Yaari (2012) found in their study cannot be compared with the environments of the present study because the first two consonants of all the chosen words in the present study followed the SSP, and the words examined in the other study did not.

5.3. Question Three: What Is the Minimum Sonority Distance of Initial Consonant Clusters of the Najdi Dialect?

Since the current study is an exploratory study that aimed to investigate the word-initial consonant cluster patterns of Najdi, all the word-initial consonant clusters that were pronounced by more than 50% of the subjects will be considered as an allowed cluster pattern in Najdi.

Table 3 presented all the pronounced consonant clusters that have Najdi's minimum sonority distance, which is one sonority distance step between the first and second onsets. It reveals that native Najdi speakers allow word-initial consonant clusters with one sonority distance step, except for the words that start with consonant clusters consisting of a nasal followed by a liquid as in /maridˤ/. Thus, Najdi allows stop-fricative, fricative-nasal, and liquid-glide word-initial consonant cluster patterns as found in /tsamʊħ/, /ħmar/, and /rwajah/.

Table 4 presented all the pronounced consonant clusters that had two sonority distance steps between the first and second onsets. It reveals that Najdi native speakers also allow word-initial consonant clusters with two sonority distance steps. As a result, in Najdi, stop-nasal, fricative-liquid, and nasal-glide word-initial consonant cluster patterns can be found as in /tnadi/, /zraʕəh/, and /mwafɪq/.

Finally, Table 5 revealed that Najdi allows word-initial consonant clusters with three sonority distance steps between the first and second onsets. Therefore, it allows stop-liquid and fricative-glide word-initial consonant cluster patterns as in /trab/ and /θɪjab/.

Up to this point, it seems that the existence of word-initial consonant clusters in Najdi is systematic since the greater the sonority distance in onset clusters, the more cluster patterns the participants pronounced. To illustrate that, there was at least one example of each cluster pattern that has two or three sonority distance steps between its first two onsets whereas there was no instance of a cluster consisting of fricative followed by nasal, which has one sonority distance between its first two consonants. Therefore, according to these findings, Najdi's word-initial consonant clusters followed the SSP since sonority distance played a role in the frequency of the initial clusters. Likewise, Carlisle (1991a) found similar results in his study when the participants modified fricative + nasal /sm/ and /sn/ more frequently than fricative + liquid /sl/ which reflects how sonority distance played a sufficient role in the perception of one cluster as easier than the other. However, the results of the present study and Carlisle (1991a) disagree with Abrahamsson's (1999) findings.

However, interestingly, the initial consonant clusters that have the maximum sonority distance between the first and second consonants were mostly pronounced with a vowel in between as they are in Classical Arabic (see Table 6). Both of these words, /qawarb/ and /dawam/, start with a stop followed by a glide. At first glance, this finding seems to go against the SSP, but it can be interpreted in a way that does not contradict the SSP. The glides in Najdi might function as a vowel rather than a regular consonant due to their high sonority, which lets the subjects preserve the first vowel /a/. This interpretation means that Najdi has a middle non-onset syllable, which is different from the Classical Arabic syllable structure.

5.4. Question Four: How Frequently Do the More Marked Initial Consonant Clusters Occur Compared to the Less Marked Initial Consonant Clusters?

Tables 7, 8, and 9 divided all the words into three groups based on their markedness level. Observing those three tables supports the assertion that the more marked the sound is, the more difficult it is to acquire (Eckman, 1977). Table 7 contained the words that had the most marked initial clusters when deleting the first vowel, compared to the other two groups, since the words that Table 7 included had three-member onset clusters. Therefore, all of the subjects preserved the first vowel to avoid the most marked initial consonant clusters, which consist of three-member onsets. In contrast, the subjects deleted the first vowel in some of the words presented in Tables 8 and 9 since the deletion only created a two-member onset cluster. This finding closely matches the results found in Eckman (1991), who found that the presence of the less marked margin precedes the more marked one.

Table 8 presented the 12 word-initial consonant clusters that began with an obstruent, which are generally less marked than all the clusters that started with a sonorant, which were shown in Table 9. Six out of 12 of the words were mostly pronounced with a word-initial cluster, whereas the other 6 words were mostly pronounced with a one-member onset as they are in Classical Arabic pronunciation. However, when ignoring the words that have a glide as a second onset, since they are the most marked words among this group, the number of word-initial consonant clusters in that group would increase from 50% to 62%, which would agree with the MDH.

Considering that the words in Table 8 had the least marked initial consonant clusters, it would seem likely that fewer initial consonant clusters would be found in Table 9. But two thirds of the words in Table 9 were pronounced with initial consonant clusters. However, all the

pronounced initial clusters in Table 9 had a glide as the second consonant in the cluster, which makes this situation different. Glides, as they were interpreted above, function in Najdi as vowels; thus, the clusters in Table 9 that were produced are not as marked as if the second consonant in the onset were a non-glide consonant. As a result, after the vowel was deleted in /rɪjadˤah/ and became /rjadˤah/, the second consonant /j/ may be used as a substitute for the deleted vowel in this case.

In a nutshell, the less marked initial consonant clusters in Najdi occur more frequently than the more marked clusters. Table 7 showed no single instance of vowel deletion since it would have resulted in a three-member onset cluster, whereas Table 9 showed six out of 12 words pronounced with word initial consonant clusters. Table 9, which contained six initial clusters that were more marked than those in Table 8, revealed that the words with a non-glide second consonant were not pronounced with initial clusters, whereas the words with a glide second consonant were pronounced with initial consonant clusters. This led to an interpretation that glides function as vowels in Najdi. These findings agree with what were found in Anderson (1987), Eckman (1977), and Eckman (1991).

5.5. Prothesis and Initial Consonant Cluster in Fluent Speech

Prothesis was one of the phonological features that some of the subjects used (see Table 12). Prothesis was expected to occur as a repair tool to avoid an initial consonant cluster, and it did appear in 20% of the subjects' pronunciation in two words, /uðnub/ and /ɪħmar/, when pronouncing them individually. The number of the subjects who used prothesis increased to 60% when pronouncing /ɪħmar/ in a sentence. Also, 80% of the subjects pronounced /umwafɪq/ with prothesis when they were reading it in a sentence. It is hard to analyze or predict exactly when the prothesis occurs due to the limited data, even though it seems to occur when a vowel

preceded by a fricative and followed by a nasal is deleted. However, this result conveys that prothesis can be used in Najdi because of vowel deletion. Prothesis is used as a repair strategy in Classical Arabic to avoid initial consonant clusters when the first vowel of a word was deleted due to a morphological rule.

Subjects were asked to pronounce all the words in a sentence again to determine whether or not fluent speech would make any significant difference in their production. The results revealed that pronouncing the words in sentences did change the frequency of producing the initial clusters slightly, but not enough to change the overall findings (see Table 13). This finding is evidence that the initial consonant clusters in Najdi are a new phonological feature, compared to Classical Arabic, rather than an effect of fluent speech.

5.6. Limitations and Recommendations

This study revealed the existence of initial clusters in Najdi Arabic, and it supported the claim of this study that Najdi is unlike Classical Arabic in allowing initial clusters. However, determining word-initial consonant cluster patterns in a language or dialect that was not investigated in this particular manner before is a hard task to be fully analyzed in one study. In fact, this study is limited due to many possible phonological effects on the results that were not discussed, including the consonants' place of articulation in the given words and the pattern of the deleted vowels. In addition, the sample and the data of this study were quite limited.

This study focused on determining the minimum sonority distance of initial consonant clusters in Najdi. Although the SSP theory can explain how the sonority hierarchy should be ranked, it could not distinguish exactly between a good cluster and a bad one. For example, /tl/ and /pl/ have the same sonority slope, but only /pl/ is accepted as an initial consonant cluster in English (Duanmu, 2002). Therefore, all the possible sonority distances between first and second

onset were investigated in this study, but not all possible consonant combinations in each manner of articulation were examined. Thus, it is difficult to tell, based on this study, which clusters are good or bad in Najdi. Also, all the recorded words start with a consonant that is less sonorant than the following one in order to follow the SSP. Thus, this study cannot reveal whether or not Najdi has reverse sonority clusters.

All the clusters that the subjects produced in the given data were a result of vowel deletion. As a result, it is not only the case that the sonority distance between the first and second onset of the pronounced clusters made them easy for the subjects to produce, but the length and the type of the deleted vowel may have also played a role. By looking at Table 10, it is easy to notice how the quality of the target vowel played a role in the findings. Most of the deleted vowels were high and the preserved ones were low regardless of the cluster pattern. There are some studies that provided evidence of the vowel pattern effect on making a cluster. Glowacka (2001) examined the relationship between unstressed vowel deletion and consonant clusters in English. Likewise, Al Hammadi, Luwa, and Yaari (2012) conducted a study to examine whether Yemeni people delete vowels in their dialects. The researchers found that all Arabic dialects of Yemen have initial clusters as a result of deleting short vowels in some cases, except the Aden dialect.

The results of this study should not be generalized to all Najdi native speakers due to the fact that the sample was small and limited to university students in the U.S. who could have been affected by others' pronunciation due to their interactive environment. Also, the chosen data was too limited to discover word-initial consonant cluster patterns in the entire Najdi dialect.

Finally, although this study provided evidence of the existence of word-initial consonant clusters in Najdi and their minimum sonority distance, it would have provided much more if the

sample and the words list were bigger. Specifically, having a large number of words and dividing them based on the sonority slope of their first two consonants and the pattern of the vowel between them would give more precise results that would reveal the environments of initial clusters in Najdi. In addition, these words should have all the existing phonemes in Najdi's inventory. This kind of data in a future study would be able to investigate initial consonant cluster patterns of the entire dialect.

5.7. Conclusions

As mentioned earlier, the purpose of this study was to investigate the patterns of initial consonant clusters produced in the Najdi dialect and measure its sonority scale. Unlike Classical Arabic, the study hypothesized that word-initial consonant clusters exist in Najdi. The instrument was a list of 24 words and 24 sentences that can determine the minimum sonority distance of Najdi consonant clusters. The study has a sample consisting of ten native Najdi speakers who pronounced the given words.

At the beginning of chapter two, the syllable structure of Classical Arabic was explained and supported by some studies that revealed evidence of the absence of initial consonant clusters in the language. The study started the investigation by relying on two theories: the SPP and the MDH. These two theories were explained and supported by providing some studies that showed how these two theories play a fundamental role in making a consonant cluster.

Several similar studies that discussed either the existence or the absence of consonant clusters in Najdi and other Arabic dialects were presented in the literature review. Furthermore, prothesis and vowel deletion were taken into account as extra phonological features that play a role in producing a consonant cluster.

After analyzing the results, the study found that there are word-initial consonant clusters in Najdi, and the minimum sonority scale is one step between the first and second onset. Also, it found that the more sonority distance in onset clusters the more cluster patterns the participants pronounced, which clearly supports the SSP theory. Moreover, the results agreed with the MDH since the less marked clusters were more frequently pronounced than the more marked ones. Therefore, it seems that the existence of word-initial consonant clusters in Najdi is systematic, with the exception of the words that had a sonorant as a first onset and glide as a second onset. These words were produced with initial clusters even though they are highly ranked, although it may be the case that glides in Najdi are considered to be vowels in this situation.

Finding this phonological feature in Najdi Arabic is an interesting fact that clearly shows the different phonological systems of Classical Arabic and Najdi Arabic. The difference the study found between them could be more extensive than the existence of initial consonant clusters if one has an in-depth investigation. These findings encourage me to go beyond the phonological feature revealed in this study and discover the reasons behind the phonological changes between Classical Arabic and the dialects derived from it in future studies.

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APPENDICES

APPENDIX A

Demographic Information

Dear participant,

I appreciate your time and effort in taking this questionnaire. I would like to inform you that this is **not** a test or any other kind of evaluation form. The given information will help me to improve my research, which examines issues related to phonological features in the Najdi dialect. Therefore, it is necessary to get responses that reflect your knowledge regarding certain questions. Please try to answer all the following questions.

Many thanks,

Bandar Alghmaiz

Please check the appropriate answer or fill in with a relevant information**.**

1. What is your gender?
    a. Male.
    b. Female.
2. What is your age?
    a. 20 or under
    b. 21 – 25
    c. 26 – 30
    d. 31 – or older
3. In what city were you raised? And what was the neighborhood name?

4. What Arabic dialect do you speak?
    a. Najdi dialect.

b. Hejazi dialect.

c. Eastern dialect.

d. Southern dialect.

e. Northern dialect.

5. What is the highest level of education you have completed that was given in Standard Arabic?

a. High school or equivalent.

b. Some college.

c. Bachelor's degree.

d. Master's degree.

e. Doctoral degree.

f. Other, _____

APPENDIX B

Scoring table including list of words used in the instrument

Subject #

Cluster Pattern	Word List	English Translation	IPA Transcription	Word-initial Cluster	Classical Arabic-like	Prothesis Process
-VS+-VF	تسامح	forgiveness	/tasamʊħ/			
VS+VF	بذور	seed	/bʊður/			
-VF+VN	حمار	sonkey	/ħımar/			
VF+VN	ذنوب	sins	/ðunub/			
VN+VL /r/	مريض	sick	/maridˤ/			
VN+VL /l/	ملاك	angel	/məlak/			
VL+VG /w/	رواية	novel	/rɪwajah/			
VL+VG /j/	رياضة	sport	/rɪjadˤah/			
-VS+VN	تنادي	she calls	/tʊnadi/			
VS+VN	دماء	blood	/dɪmaʕ/			
VF+VL	سلام	peace	/səlam/			
VF+VL	زراعة	agriculture	/zɪraʕəh/			
VN+VG /w/	موافق	agree	/muwafɪq/			
VN+VG /j/	مياه	water	/mɪjah/			
-VS+VL	تراب	soil	/tʊrab/			
VS+VL	دليل	evidence	/dalil/			
-VF+VG	ثياب	dresses	/θɪjab/			
VF+VG	زواج	wedding	/zawadʒ /			
-VS+VG	قوارب	boats	/qawarb/			

VS+VG	دوام	stability	/dawam/			
-VS+VL+VG	قلوة	village name	/qɪlwah/			
VS+-VF+VL	بشرى	good news	/bʊʃra/			
-VF+VL+VG	ثروة	wealth	/θərwah/			
VN+VL+VG	مروة	Arabic name	/mərwəh/			

Note. V=voiced, -V=voiceless, S=stop, F=fricative, N=nasal, L=liquid, and G=glide

APPENDIX C

Sentences Lists

No	Sentence List (English Version)	Sentence List (Arabic Version)
1	Brothers' forgiveness is a necessity.	تسامح الإخوان واجب.
2	Do not throw the fruits' seeds.	لاترمي بذور الخضرة.
3	Where is your farm's donkey?	وين حمار مزرعتكم؟
4	People's mistakes and sins are numerous	أخطاء و ذنوب الناس كثيرة.
5	You look sick today	شكلك مريض اليوم.
6	Beautiful as an angel	جميلة كأنها ملاك.
7	I read alqosaibi's Novel yesterday	قريت رواية القصيبي أمس.
8	We should work out weekly.	لازم نسوي رياضة أسبوعيا.
9	Your sister is calling your mother.	أختك تنادي أمك.
10	There is blood in this place.	فيه دماء في هالمكان.
11	Say “peace upon you” first.	قل سلام عليكم أول.
12	This university has an agriculture department.	الجامعة هذي فيها قسم زراعة.
13	I agree to come.	إنا موافق أجي.
14	She loves water from Qassim.	تحب مياه القصيم.
15	This place has soil in it.	المكان هذا فيه تراب.
16	I have no evidence.	أنا ما عندي دليل.
17	We must buy new dresses.	لازم نشتري ثياب.
18	Tomorrow is my sister’s wedding.	بكرى زواج أخوي.
19	Are these fast boats?	هل هذه قوارب سريعة؟
20	Health is unstable.	الصحة مالها دوام.
21	I think he lives in Qelwah.	أتوقع هو ساكن في قلوة.
22	I have good news for you.	عندي لك بشرى سارة.
23	I need my father’s wealth temporarily.	أحتاج ثروة أبوي مؤقتا.
24	Her name is Marwah Alfahad.	اسمها مروة الفهد.

VITA

Graduate School
Southern Illinois University

Bandar Abdulaziz F Alghmaiz

Bander505@hotmail.com

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