Phonological Processes in the Baghdadi Gilit Dialect: An Analysis Using Optimality Theory

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Abstract

This study presents an analysis of the major phonological processes in the Baghdadi Gilit Dialect (BGD) of Iraqi Arabic, using Optimality Theory as the analytical framework. Assimilation, deletion, and epenthesis phenomena are investigated in this study to uncover the underlying constraints governing the phonological system of the dialect. Unique constraint hierarchies shaping BGD's phonology are determined using a corpus of speech data from native speakers. The results show that markedness constraints, especially HARMONY and PARSIMONY, are very strong in determining the surface representations, promoting vowel-consonant harmony and simplification processes in casual speech. Such processes are guided by the interactions of faithfulness and markedness constraints, with BGD prioritizing phonotactic ease and articulatory efficiency. The results also bring into focus important sociolinguistic factors, such as speech register and demographic variation, which influence constraint rankings and phonological variation. This study not only contributes to a deeper understanding of the phonological intricacies of BGD but also offers important insights into the greater field of Arabic linguistics, especially into the study of Bedouin-influenced dialects. The implications for this research go into theoretical phonology and add new evidence for the operation of constraint hierarchies in less well-documented dialects. In addition, the findings of this study have pedagogical implications for teaching Iraqi Arabic, especially BGD, by providing a systematic framework through which to understand its phonological patterns. Computationally, this work provides valuable insights into how to improve natural language processing models for Arabic, allowing them to better handle dialectal variation in speech recognition and synthesis. Thus, this study fills prevailing gaps

in the research on Iraqi Arabic and will help set a platform for further research into other dialects of the region, further enhancing Arabic phonology and sociophonetic variation.

Keywords: Phonology, Baghdadi Gilit Dialect, Optimality Theory, Assimilation, Epenthesis, Deletion

INTRODUCTION

The Baghdadi Gilit Dialect, also referred to as BGD, is the major variant of Iraqi Arabic which encompasses a wide range of phonological processes, hence delineating its distinctive linguistic identity within the Arabic-speaking world. There is a salient contrast between the nature of Bedouin Dialect, the BGD, and its urban cognates, such as Moslawi Qʙltu Dialect, MQD. BGD is a dialect that has been highly influenced by Bedouin factors. These features, deeply set within the historical and sociolinguistic flux, are examples of the synthesis of Bedouin linguistic norms with those of urban varieties. Such a synthesis came through via centuries of interaction and transformation processes lanc, 1964; Jastrow, 2006; Alshammari, 2023. Assimilation, epenthesis, and deletion are examples of important phonological events that are associated with BGD. These phenomena provide insights into the underlying cognitive and sociolinguistic processes that control the utilization of BGD.

The Iraqi Arabic language, as part of Mesopotamian Arabic, consists of two major dialect groups-namely, Qʙltu and Gilit. Both are closely related to the very historical, demographic, and sociolinguistic nature of the region itself. There are several archaic characteristics of Old Arabic that are preserved in the Qʙltu Dialect (QD), which is largely spoken by non-Muslim populations and urban communities. Gilit Dialect (GD), which includes Bedouin Dialect (BGD), represents a dialect that is more closely aligned with the Bedouin-speaking populations of Iraq. These divisions reflect the Mongol invasions and Bedouinization of Baghdad and other urban areas during the Ottoman Empire (Blanc, 1964; Jastrow, 1994; Ingham, 2009).

This research will make use of Optimality Theory, henceforth OT, as an advanced theoretical framework in the view of Prince and Smolensky, 1993 and Tesar and Smolensky, 2004. OT is a model that analyzes language outputs based on the interaction of hierarchically graded constraints. Due to its two fundamental principles, faithfulness and markedness, OT is especially applicable to the analysis of the phonological processes involved in BGD development. For instance, the faithfulness constraints, such as MAX, which prohibits deletion, and DEP, which prohibits insertion, in interaction with markedness constraints such as HARMONY, promoting vowel-consonant harmony, jointly determine the linguistic output. It is these constraints that determine the shape of the emergent languages. These interactions, according to McCarthy (2008) and Pater (2009), provide insight into how BGD prioritizes one phonological pattern over another, thus revealing its broader linguistic strategy aimed at maximizing clarity and articulation efficiency. Specifically, the high-ranking vowel harmony phenomenon, which stresses the consistency of vowel qualities within or across syllables, is one of the unique adaptations that BGD shows in response to its phonological environment. This phenomenon, which is frequently caused by sociolinguistic characteristics such as casual speech or quick articulation, exemplifies how the dialect strikes a compromise between cognitive efficiency and communicative clarity (Salman, 2021; Alshammari, 2023). This research employs an extensive corpus analysis in order to explore the driving of assimilation, epenthesis, and deletion by constraint hierarchies. The paper also explores sociolinguistic and cognitive components that influence the above-mentioned phonological processes.

Iraqi Arabic remains underrepresented in phonological research in comparison with other varieties of Arabic, such as Egyptian and Levantine Arabic, though it is filled with a great deal of linguistic information. Despite the fact that an extensive quantity of research has been done on significant regional varieties, there is still little deeply analytic work that is targeted towards the fine phonological processes associated with BGD in the constraint-based-theory perspective of OT, hence a few research papers presented, such as Alshammari (2023) and Salman (2021). Given that BGD is a prominent variety of GD, which presents a unique insight into the nature of the dynamics of Bedouin phonology and its interaction with urban influences, this gulf between the two is rather significant.

Key phonological processes such as assimilation, epenthesis, and deletion in BGD are regulated by an intriguingly complex interaction of constraints which have not yet been closely examined. For example, while vowel-consonant harmony has been described as a feature of BGD, previous studies often neglect the sociolinguistic and contextual factors-such as speech register and speaker demographics-that drive such patterns and trends in variation (Blanc, 1964; Holes, 2007). Additionally, markedness constraints like PLACE [DISTANT, which penalizes unnecessary segment insertion, and DEP, which penalizes the assimilation of elements across long distances, have not been subjected to in-depth study within the context of BGD's constraint hierarchy.

Other strong points of serious contrasts which are worthy of detailed discussions, are revealed through the comparison between BGD and MQD. MQD is urban and retains several features of Old Arabic, while it relies more on faithfulness constraints, such as MAX, to preserve the input characteristics. By contrast, the Bedouin dialect shows the trend toward phonological simplicity and articulatory efficiency, which may have been influenced by its Bedouin origin and subsequent exposure to urbanization (Jastrow, 1994; Al-Siraih, 2013). These distinctions reveal broader patterns of language evolution that have been influenced by geography, religion, and cultural practices. They also reveal the sensitive interplay that exists between historical events and linguistic change.

OT is utilized in the analysis of the phonological processes in BGD for a deeper understanding of its constraint hierarchies. This paper addresses these gaps by using OT to analyze the phonological processes. The purpose of this research is to provide a full description of the phonological complexities of BGD by using recent developments in phonological theory as well as actual data collected between the years 2015 and 2024. In addition to enhancing the study of Arabic dialectology, this approach also makes a contribution to broader discussions in the field of theoretical phonology with its contributions.

Objectives of the Study

The first aim of this research is to undertake a systematic identification and to document the core phonological processes characterizing the Baghdadi Gilit Dialect, one of the Iraqi Arabic vernaculars. Among them are assimilation, epenthesis, and deletion as inherent in understanding how the BGD shapes its spoken form. By focusing on these processes, the study will uncover the phonological phenomena that distinguish BGD from other varieties of Arabic, particularly those with more urban influences like Moslawi Qəltu Dialect (MQD). This documentation will provide a comprehensive account of BGD's phonological behavior and shed light on the regularities and exceptions that define the dialect's unique phonological system. This is a very crucial objective that will help enhance the knowledge of Iraqi Arabic, as only a few

studies have been conducted on BGD in comparison with other Arabic dialects like Egyptian and Levantine Arabic. The findings will fill gaps in the literature and give a comprehensive description of BGD's phonological landscape. By identifying such processes, this study also hopes to highlight how the phonological system in BGD reflects various sociolinguistic factors, such as speech style, register, and social context, which all affect the way these processes would be applied in everyday conversation. To Analyze These Processes Within the OT Framework to Understand Constraint Interaction and Ranking in BGD

The second aim is to apply Optimality Theory to the identified phonological processes in BGD, focusing on the interaction and ranking of phonological constraints involved. According to OT, linguistic outputs are the result of the competition between faithfulness constraints, which preserve the features of the input, and markedness constraints, which favor simpler, less marked structures. The research will see how BGD resolves such competing constraints, especially in the processes of assimilation, epenthesis, and deletion using the OT framework. In particular, this study will investigate the constraint hierarchy in BGD. For instance, the study shall be interested in the dominance of markedness constraints like HARMONY-which enforces vowel-consonant harmony-and PARSIMONY-which favors phonological simplification.

The above constraints are crucial in determining the surface forms of BGD's spoken language, and their interaction with faithfulness constraints such as MAX (preventing deletion) and DEP (preventing insertion) will provide insight into how the dialect prioritizes certain phonological processes over others. This analysis will also consider how rankings of constraints shift in various sociolinguistic contexts, such as formal versus informal speech, or across different demographic groups, such as age and gender. Such an understanding of how these constraints is ranked and interact within the context of BGD will provide broader insights into the theoretical underpinnings of phonological systems, particularly in under-researched dialects. By comparing BGD's constraint rankings to those of other Arabic dialects, the study will also help place BGD within the broader typology of Arabic phonology and offer fresh insights into the field of theoretical phonology.

RESEARCH QUESTIONS AND HYPOTHESES

Based on the above-mentioned objectives of the study, the following research questions and hypotheses were formulated:

RQ1. What are the major phonological processes occurring in BGD?

RQ2. How can these processes be analyzed using OT to determine constraint interactions?

H1. Assimilation processes in BGD prioritize markedness constraints, such as HARMONY, over faithfulness constraints.

H2. Deletion and epenthesis processes reflect an interplay between PARSIMONY and DEP constraints to optimize simplicity in informal speech contexts.

SIGNIFICANCE OF THE STUDY

The contribution that this research offers to Arabic linguistics lies in the valuable attempt to fill a long-standing gap in the detailed study of Baghdadi Gilit Dialect using the Optimality Theory approach. By focusing on the interaction of markedness and faithfulness constraints to provide an insight into how assimilation, epenthesis, and deletion phonological processes are derived, this study adds not only to our insight into BGD but also to the overall study of Arabic phonology. While Arabic dialects are widely studied, the phonological complexities of BGD remain largely unexamined, and this work brings to light its peculiar linguistic features within the theoretical framework of OT, rarely utilized in Arabic dialectology so far, and thus constituting a further contribution to Prince and Smolensky 1993 and Pater 2009.

Theoretically, this work contributes to the advancement of phonological theory by showing how OT's constraint-based model can be successfully applied to dialect-specific phonological processes. For example, the top-ranked constraints responsible for vowel harmony in BGD give insight into the phonotactic preferences of the dialect: what cognitive and articulatory principles underlie its phonological outputs. The research also covers the sociolinguistic aspects of BGD, which indicate how speaker demographics and speech contexts influence the hierarchies of constraints, adding to our knowledge of language variation and change (McCarthy, 2008; Alshammari, 2023).

These findings are of great importance to sociolinguistics and Arabic dialectology. The comparison between BGD and Moslawi Qəltu Dialect (MQD) sets out the sociolinguistic and historical factors that have conditioned their divergent phonological systems. This comparison underlines urbanization, Bedouinization, and religious demographics as factors in the development of Iraqi Arabic dialects and thereby offers a nuanced view of the relationship between language and identity in the region (Blanc, 1964; Jastrow, 2006). Furthermore, the identification of BGD-specific marked constraints will contribute to the typological database of Semitic phonology and provide a comparative insight for cross-linguistic studies both within and outside Arabic.

The study is pedagogically relevant for the teaching of Iraqi Arabic, in particular BGD, to non-native speakers. It represents a coherent framework for the explanation of the phonotactic phenomena that may help in improving the teaching and learning of pronunciation by explaining the phonological patterns and their underpinning constraints. The findings provide a number of practical applications in language documentation and revitalization endeavors, particularly in the preservation of Iraqi Arabic's linguistic heritage given the sociopolitical and cultural changes that Salman (2021) and Yussif & Mohammed (2023) have observed.

In computational linguistics, the OT-based analysis presented in this study will further inform the creation of more accurate models for the Arabic language. For example, a detailed understanding of the constraint hierarchy involved in phonological processes in BGD will provide a potential improvement in algorithms for speech recognition systems, machine translation, and NLP. Integrating these insights into computational tools can go a long way toward ensuring that such tools account for dialectal variation and thus perform better across different Arabic-speaking communities (Habash, 2010; Albuarabi, 2018).

In all, this in-depth analysis of the phonological processes in BGD contributes to theoretical phonology, sociolinguistics, Arabic dialectology, and computational linguistics. It forms a basis for further research into the interaction of sociolinguistic and cognitive factors in phonological variation and provides

a model for applying OT to other less-studied dialects, enriching our understanding of linguistic diversity in Arabic and beyond.

REVIEW OF LITERATURE

The literature review carefully assesses the core and contemporary research with regard to the complexity of Arabic dialect phonology, with particular emphasis on Optimality Theory (OT) nuanced application in this area. More specifically, it zooms in on the constraints that prove to be especially pertinent and relevant for the analysis of the Baghdadi Gilit Dialect (BGD). Among these significant constraints is HARMONY, playing a pivotal role in governing the phenomenon of vowel assimilation, and MAX, which penalizes the deletion of phonological elements. Such an analysis offers valuable insights into how these constraints interact and interrelate with one another to give rise to optimal phonological forms in the dialect.
This study is located in the broader scope of wide-ranging researches on Iraqi Arabic and the domain of Arabic dialectology. It works to link and incorporate different theoretical models together with empirical data that have been arrived at through investigation.

Theoretical Framework and Context

Optimality Theory (Prince & Smolensky, 1993) revolutionized phonological analysis by positing that linguistic outputs result from the interaction of competing constraints. These constraints are classified into two categories: the markedness constraints, which favor the simpler, unmarked forms, and the faithfulness constraints, which preserve features of the input in the output (McCarthy, 2008; Pater, 2009). The central components of OT, GEN (the generator) and EVAL (the evaluator), are instrumental in modeling this interaction. GEN produces a set of possible outputs and EVAL picks the best candidate under an ordered hierarchy of constraints. The ordering of the constraints is language-specific, responsible for cross-linguistic variation in the patterns of phonology (Tesar & Smolensky, 2004; Tseng, 2021).

In Arabic phonology, OT has been applied to analyze phenomena like assimilation, vowel harmony, epenthesis, and deletion. The presence of constraints like HARMONY, a principle that advocates and spreads vowel harmony through the given linguistic domain, and DEP, which is a principle that penalizes the insertion of extra segments, has been important in understanding the rich phonological structure inherent in the Arabic language. Additionally, deletion processes, controlled by constraints such as MAX, are a great way to understand what kind of simplification strategies speakers use when they speak rapidly or in informal settings—a fact well illustrated in works like Salman (2021) and Alshammari (2023).

Despite OT's strong theoretical potential, its application to less-studied Arabic dialects, including BGD, remains limited, underlining the need for more research.

Empirical Background

Phonological studies on the numerous Arabic dialects have documented at length a large number of processes that are determined to a great extent by historical contexts, sociolinguistic dynamics, and geographical considerations. In Iraqi Arabic, for instance, this dialect is strikingly distinguished by the existence of two major varieties that go by the names Qəltu and Gilit dialects; each of these carries phonological characteristics that accurately represent their different and individual sociolinguistic histories

(Blanc, 1964; Jastrow, 2006). More importantly, the effects of Bedouin influence upon BGD are particularly striking, as they come to surface in a strong trend towards using assimilation, deletion, and epenthesis as common mechanisms resorted to in order to ease up and simplify speech forms (Holes, 2007; Abu-Haidar, 1991). Comparative analyses of the different Arabic dialects have considerably shed light on the complex ways in which constraints interact variably across the many varieties. For instance, in Bedouin-influenced dialects, such as BGD, vowel harmony is significantly more prominent, reflecting a high-ranking preference in which HARMONY is ranked high in the overall constraint hierarchy, hence favoring vowel agreement across multiple syllables. Urban dialects, however, such as the Moslawi Qəltu Dialect (MQD), generally display more conservative phonological processes. These urban varieties prioritize faithfulness constraints, mainly the IDENT[PLACE] constraint, in order to successfully maintain lexical distinctions crucial for communication and comprehension (Jastrow, 1994; Albuarabi, 2018). These findings demonstrate how sociolinguistic context shapes phonological systems, with Bedouinization and urbanization influencing constraint interactions (Alshammari, 2023).

Although Optimality Theory (OT) has been utilized in the examination of various Arabic dialects, its application in analyzing the specific case of BGD has remained relatively limited and infrequent. This is especially true when it comes to the aspects of deletion and epenthesis, where there is a noticeable lack of comprehensive research. The existing studies that have been conducted often tend to concentrate on well-documented and widely studied dialects, such as Egyptian Arabic or Levantine Arabic, which are more commonly explored in the literature. As a result, this has inadvertently created a significant gap in our understanding of how the unique phonological processes inherent to BGD are influenced and governed by the hierarchies of constraints that are fundamental to this theoretical framework (Salman, 2021; Al-Siraih, 2013). For example, it has been noted that vowel harmony is of great importance in BGD; still, only limited research has been conducted into the interactional and relational aspects of HARMONY with other constraints like MAX and DEP, which are ultimately decisive in defining the phonological outputs. Furthermore, the sociolinguistic dimensions concerning constraint ranking, such as the ways in which rapid speech or informality may modulate and impact the emergent phonological patterns, remain drastically understudied within BGD. This existing gap in the literature presents a clear opportunity for this study to contribute entirely new and novel insights into the complex phonology of Iraqi Arabic, enriching our understanding of this particular linguistic aspect. Through the systematic and methodical analysis of assimilation, deletion, and epenthesis carried out in the Optimality Theory (OT) framework, this study seeks to present a detailed explanation of the hierarchical structure underlying the various constraints in BGD. This attempt subsequently provides an extensive and articulate account of the involved complex phonological intricacies characteristic of this language. In addition, the research takes a comparative approach examining not only BGD but also contrasting it with MQD, which considerably enriches our knowledge of regional phonological variation. In particular, this aspect of the study tackles an essential domain that has traditionally been dealt with inadequately in the literature, as pinpointed by Blanc in 1964 and Albuarabi in 2018. By addressing these gaps, the study not only enriches Arabic dialectology but also advances OT as a tool for analyzing underrepresented languages and dialects.

METHODOLOGY

Research Design

This study employs a descriptive and analytical design to investigate the phonological patterns and constraint hierarchies in Baghdadi Gilit Dialect (BGD). The approach integrates qualitative methods to capture the intricacies of phonological processes, focusing on the interplay of constraints within the Optimality Theory (OT) framework. By systematically analyzing both field-collected and existing speech data, the study ensures a comprehensive examination of how phonological phenomena such as assimilation, epenthesis, and deletion are governed by constraint hierarchies. This design is particularly suited for exploring under-documented dialects like BGD, as it emphasizes empirical rigor and theoretical interpretation (McCarthy, 2008; Alshammari, 2023).

Corpus of the Study

The corpus for this study consists of speech data collected from 20 native speakers of BGD, selected to represent a diverse range of ages, genders, and socioeconomic backgrounds. This demographic variation ensures the inclusion of phonological variation influenced by sociolinguistic factors. The data comprises approximately 100 hours of recorded natural speech, drawn from informal conversations, narratives, and elicited linguistic tasks. To complement this, publicly available corpora of Iraqi Arabic were incorporated, providing a robust dataset for analyzing BGD's phonological processes (Salman, 2021; Jastrow, 1994).

Model of the Study

The study adopts OT's GEN-EVAL model (Prince & Smolensky, 1993), a widely used theoretical framework for analyzing phonological patterns. GEN generates a range of possible candidate outputs for a given input, while EVAL selects the optimal output by assessing constraint violations. The model's focus on constraint ranking and violation analysis is particularly effective for understanding BGD's phonological processes, where faithfulness and markedness constraints interact dynamically to produce observed patterns (Tesar & Smolensky, 2004; Pater, 2009).

Data Collection Procedures

Speech data were collected through field recordings conducted in Baghdad and surrounding regions. Participants provided informed consent after being briefed on the study's purpose and procedures, ensuring ethical compliance. The recordings were conducted in naturalistic settings to capture authentic phonological patterns, supplemented by targeted elicitation tasks designed to isolate specific processes like assimilation and deletion (Albuarabi, 2018; Holes, 2007).

Ethical approval was obtained from relevant institutional review boards, ensuring that data collection adhered to ethical standards, including participant anonymity and data confidentiality. Additionally, the study leveraged publicly available corpora of Iraqi Arabic, cross-referencing these datasets to validate findings and enhance the reliability of the analysis (Salman, 2021).

Data Analysis Procedures

The collected data were transcribed phonetically, using the International Phonetic Alphabet (IPA) to ensure precision in capturing BGD's phonological details. Each transcription was analyzed to identify occurrences of phonological processes such as assimilation, epenthesis, and deletion. The data were then subjected to

OT tableau analyses, where candidate outputs were evaluated against ranked constraints to determine the optimal forms.

The analysis focused on identifying constraint interactions and violations, providing a detailed account of how BGD resolves phonological conflicts. For instance, tableau analyses were used to demonstrate how high-ranking constraints like HARMONY override lower-ranked constraints like DEP in contexts favoring vowel harmony. Similarly, deletion processes were examined through the lens of MAX violations, revealing how sociolinguistic factors influence constraint ranking in informal speech contexts (Salman, 2021; Alshammari, 2023).

By combining qualitative transcription with quantitative constraint evaluation, the study ensures a comprehensive analysis of BGD's phonological patterns, contributing both empirical data and theoretical insights to the fields of Arabic dialectology and phonology.

RESULTS

This section presents the key phonological processes in Baghdadi Gilit Dialect (BGD) as analyzed within the framework of Optimality Theory (OT). The focus is on assimilation, epenthesis, and deletion, with data drawn from field recordings and corpus analysis. Tables summarize the findings, while interpretations explain the interaction of constraints and their rankings.

Table 1

Types of Assimilation in BGD

Type	Example	Input Form	Output Form	Constraint Violated	Interpretation
Place assimilation	/ʔin+qəra/	/ʔin.qə.ra/	[ʔiŋ.qə.ra]	*IDENT[PLACE]	Nasal assimilation occurs where /n/ takes the place feature of the following velar /q/, driven by high-ranking PLACE constraints.
Voicing assimilation	/ʔad+tab/	/ʔad.tab/	[ʔat.tab]	*IDENT[VOICE]	Voicing harmony aligns the voicing of adjacent consonants, prioritizing markedness over faithfulness.
Total assimilation	/min+lɛ/	/min.lɛ/	[mil.lɛ]	*MAX, *IDENT[PLACE]	Total assimilation simplifies complex clusters, ranking MAX lower to achieve phonological harmony.

BGD prioritizes assimilation to simplify articulation and enhance fluidity in speech. High-ranking constraints like PLACE dominate faithfulness constraints such as IDENT[PLACE] and MAX, leading to predictable patterns of segment assimilation. Voicing and place adjustments indicate the dialect's emphasis on phonological economy and ease of articulation.

Table 2

Epenthesis Patterns in BGD

Type	Example	Input Form	Output Form	Constraint Violated	Interpretation
Vowel epenthesis	/smn/	/smn/	[si.ma.n]	DEP	A vowel is inserted between consonants to resolve syllable constraints, maintaining onset integrity.
Consonant epenthesis	/ʔilʕil/	/ʔilʕil/	[ʔil.ʔil]	DEP	Consonant insertion occurs to break challenging sequences, favoring markedness constraints.

Epenthesis in BGD reflects a strategy to ensure well-formed syllable structures, driven by constraints such as ONSET and NOCODA. Although DEP penalizes insertions, it is ranked lower than constraints that penalize complex clusters, emphasizing the dialect's preference for simplicity and syllable balance.

Table 3

Deletion Patterns in BGD

Type	Example	Input Form	Output Form	Constraint Violated	Interpretation
Vowel deletion	/ʔilɑʕib/	/ʔi.la.ʕib/	[ʔil.ʕib]	MAX	Unstressed vowels are deleted in rapid speech, optimizing fluency while tolerating minor faithfulness violations.
Consonant deletion	/qɑlb/	/qalb/	[qal]	MAX	Final consonants are omitted in casual contexts, ranking markedness over faithfulness.

Deletion processes in BGD occur primarily in informal or rapid speech contexts, driven by high-ranking constraints like PARSIMONY, which favor simplicity in output forms. While MAX violations are tolerated, the dialect maintains essential lexical distinctions by limiting deletion to unstressed or non-critical segments.

Table 4

Constraint Rankings Based on Findings

Constraint	Ranking (Relative)	Processes Affected
HARMONY	High	Drives vowel harmony in assimilation.
MAX	Medium	Balances faithfulness in deletion contexts.
DEP	Low	Allows epenthesis to maintain syllable structure.
PLACE[DISTANT]	High	Penalizes distant place assimilation.

The rankings reflect the dialect's tendency to prioritize markedness constraints like HARMONY and PLACE[DISTANT], which streamline phonological forms and align with cognitive ease. Faithfulness constraints like MAX and DEP play supportive roles but are ranked lower to accommodate phonological processes such as epenthesis and deletion.

The above analysis reveals that BGD's phonological system is driven by a hierarchy of constraints that emphasize economy, harmony, and structural balance. High-ranking markedness constraints govern the observed processes, highlighting the dialect's adaptation to sociolinguistic and cognitive factors. These findings contribute to the broader understanding of Arabic phonology and demonstrate the utility of OT in analyzing underexplored dialects.

DIDCUSSION

Discussion Related to the First Hypothesis

Hypothesis: Assimilation processes are a dominant feature of Baghdadi Gilit Dialect (BGD), which is shaped by its phonological constraints.

These results strongly confirm the hypothesis that the most prevalent assimilation processes in BGD are place, voicing, and total assimilation. The prominence of these processes indicates that markedness constraints such as PLACE and HARMONY are prioritized over faithfulness constraints like IDENT[PLACE] and MAX. For instance, nasal assimilation, where /ʔin.qə.ra/ becomes [ʔiŋ.qə.ra], underlines how the dialect simplifies articulation to enhance phonological harmony.

Comparative studies in Bedouin dialects similarly emphasize assimilation as a core strategy for reducing articulatory complexity and achieving smoother transitions between sounds (Holes, 2007). For instance, Alahmari (2018) identifies robust place assimilation in Southwestern Saudi Arabic, where nasal consonants frequently conform to the place of articulation of neighboring stops. These patterns align closely with BGD, reflecting shared Bedouin linguistic traits.

Recent research also emphasizes the sociolinguistic aspect of the assimilation process. Investigations into rapid and informal speech contexts in Northwestern Saudi Arabic demonstrate that assimilation becomes more frequent, induced by the same markedness constraints that operate in BGD

(Alhawaykim 2018). This evidences the hypothesis that assimilation in BGD is not only a phonological phenomenon but also a sociolinguistically adaptive strategy.

Discussion Related to the Second Hypothesis

Hypothesis: Deletion and epenthesis in BGD are governed by constraint hierarchies which reflect informal speech patterns in Arabic dialects.

The results affirm this hypothesis, demonstrating that phonological economy and well-structured syllable structures remain the driving factors behind deletion and epenthesis processes in BGD. In deletion, for example, unstressed vowels and coda consonants are deleted, as in /ʔilaʕib/ → [ʔil.ʕib], due to the high ranking of PARSIMONY and tolerance for violations of MAX. Epenthesis is also used to break up impossible clusters, inserting vowels and glottal stops to maintain syllable integrity, as seen in /smn/ → [si.ma.n].

These findings are in agreement with research carried out on other Arabic dialects, whereby deletion and epenthesis processes are sensitive to sociolinguistic contexts. For instance, Ali (2014) observes similar deletion patterns in Sudanese Arabic, whereby unstressed vowels are often deleted in informal speech. Similarly, Salman (2021) reports frequent epenthesis in Iraqi Arabic dialects, especially in those varieties influenced by Bedouin, as a means of resolving syllable constraints.

Constraint hierarchies in BGD mirror those in other dialects but exhibit unique rankings. For instance, HARMONY outranks DEP in BGD, prioritizing vowel harmony even at the expense of insertion penalties. This contrasts with MQD, where DEP and MAX are more balanced, reflecting its urban linguistic heritage (Jastrow, 1994; Albuarabi, 2018). These differences underscore the interplay between Bedouinization and urbanization in shaping dialect-specific phonological systems.

CONCLUSION

This research confirms the assumptions concerning assimilation, deletion, and epenthesis in the BGD dialect, such that a hierarchical system of constraints with markedness always ranking above faithfulness does indeed characterize these changes within BGD. Moreover, it shows that for each of the phonological phenomena-assimilation, epenthesis, and deletion-undergoing processes in BGD are given their nature by the dynamic behavior created between these constraints. More specifically, phonological simplification and ease of articulation are driven by markedness constraints like HARMONY and PARSIMONY. These processes highlight BGD's preference for efficiency in speech production, with a clear tendency to reduce complexity, particularly in informal or rapid speech contexts.

The research also points out that these phonological processes reflect both linguistic and sociolinguistic principles, deeply embedded in BGD's phonological system. Although BGD shares core features with other Bedouin-influenced Arabic dialects, such as a focus on simplification and harmony, it also retains unique phonological characteristics that distinguish it from urban varieties like Moslawi Qəltu Dialect (MQD). This comparison underlines how the historical and sociolinguistic context of the speakers of BGD has traced the course of phonological development that the dialect has undergone. These

phonological processes, on the other hand, are influenced by factors like urbanization, social status, and speech register, adding to the complexity of the understanding of the linguistic system of BGD.

The study, in the long run, contributes to a richer understanding of the phonology of BGD by showing how a constraint-based framework like Optimality Theory (OT) can help with the subtlety of lesser-studied dialects. By focusing on the role of constraint hierarchies, the research develops a detailed picture of the phonological principles governing BGD and its distinct position within the broader landscape of Arabic dialectology.

Implications of the Study

This research contributes significantly to theoretical phonology, especially in the application of Optimality Theory to less well-documented dialects. By demonstrating how the phonological processes of BGD are controlled by a dynamic interaction of markedness and faithfulness constraints, this research adds to the knowledge base on applying OT to Arabic dialectology. The study emphasizes the flexibility of OT in handling dialect-specific phonological systems and provides a framework that can be replicated for other underrepresented varieties of Arabic. These insights go further in deepening understanding about phonological variation and the hierarchical nature of constraints in less-documented dialects. It emphasizes the sociolinguistic dimensions of BGD's phonology, showing how speech register and social factors such as age, gender, and formality influence the application of phonological processes. This finding aligns with recent sociophonetic research, which underscores the role of social identity and contextual variation in shaping linguistic outputs (Salman, 2021; Alshammari, 2023). By highlighting the interaction between the sociolinguistic variable and the phonological processes, the study gives detail on how contact shapes language development due to social factors. This thus makes the work a sourcebook for increased understanding in changing and varying Arab-speaking. Pedagogical Applications The outcomes of this present study carry much weight in their implications for pedagogic practice regarding the teaching of Iraqi Arabic and thus BGD, especially to foreign learners.

It also presents a systematic frame through which pronunciation and phonological patterns can be instructed in the detailed description of the phonological processes and constraints that govern the BGD. For these results, language instructors take advantage in the development of teaching materials and teaching methodologies since this is a dialect with complexities in its phonological features that need special attention. Understanding the interaction of the assimilation, epenthesis, and deletion processes will enable learners to produce more accurate and natural-sounding BGD. Computational Linguistics and NLP The study also has practical applications in the area of computational linguistics, in particular for developing NLP systems and speech recognition models of Arabic. A careful examination of the phonological processes of BGD offers some important insights toward enhancing the accuracy of dialect-specific Arabic language processing tools.

Applying the above findings on assimilation, epenthesis, and deletion in computational models makes it possible to create algorithms that can handle phonological variability within Arabic dialects with much more efficiency. This is particularly relevant for the development of ASR systems, where taking dialectal variation into account will be very important for improving speech recognition accuracy across different communities of Arabic speakers. Further Research Directions The results also point toward a few

further areas of research. Cross-dialectal comparisons between BGD and other varieties of Iraqi Arabic, such as MQD, as well as with other Bedouin-influenced dialects, could deepen our understanding of the phonological evolution within the region. Furthermore, a quantitative approach—incorporating experimental phonetics and sociophonetic methods—would validate the findings and offer more precise insights into the role of speech rate, register, and demographic factors in shaping phonological variation.

The application of OT to other under-studied dialects of Arabic will also enrich the typological knowledge of Arabic phonology and expand the theoretical framework to accommodate the diversity of spoken forms.

In other words, this study bears on theoretical phonology, but also importantly on issues in sociolinguistics, pedagogy, computational linguistics, and Arabic dialectology. By addressing these varied dimensions, the research contributes to the broader understanding of Arabic phonology and offers a framework for future studies in this rapidly evolving field.

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