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Nonlinear Analysis of the Morpho-phonemics of the Glottal Tri-Consonantal Verbs in Libyan Arabic: Benghazi Dialect

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التحليل غير الخطي للصوتيات الصرفية للأفعال الثلاثية الحلقية في العربية الليبية: لهجة بنغازي

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الملخص

تبحث هذه الدراسة في سلوكيات تحليل الصرف مع الصوت (المورفوفونيمي) الخاص بالأفعال الثلاثية ذات الأصوات الناتجة من الحلق تحديدا الهمزة في اللهجة الخاصة بمدينة بنغازي في ليبيا.

استخدمت الخطة البحثية لهذه الدراسة الفونولوجيا الغير خطية، خاصة نظرية الاوتوسيغمانتل والنموذج الهرمي للحروف الساكنة والمتحركة، وذلك لاختبار كيفية تفاعل الأصوات الحنجرية مع النمط او القالب الإيقاعي للأصوات. استخدم الباحث في هذه الدراسة "مجموعة من التسجيلات الطبيعية" من منصة اليوتيوب لحلقات من برامج تليفزيونية بلهجة مدينة بنغازي حيث تم تحليلها للتعرف على التبديلات النمطية المنتظمة بما في ذلك: الحذف والاطالة في الكلمات وتحويل بعض الأصوات لغيرها.

أوضحت النتائج بأن الهمزة حسب تركيبتها البنيوية تعتبر صوت مثقل او ثقيل مما يقود إلى اعادة تركيب حتى نحافظ على الوزن.

يقدم هذا البحث نبذة عن الربط ما بين العين والعقل في فهم ومعالجة اللهجة ويعرض نموذج صالح لتحليل الصرف العربي.

كلمات مفتاحية: علم اللهجات العربية (يركز على لهجات شمال أفريقيا وليبيا على وجه التخصيص) علم الصوتيات الغير خطية، نظرية الأوتوسيغمينتال(استقلالية الوحدة الصوتية)، نموذج الهيكلية للأصوات الساكتة والمتحركة، الأصوات الصرفية والأفعال الحنجرية (الهمزة)، الاطالة الصوتية، نظرية المورا.

Abstract

Abstract:

This study is an attempt to examine the morphophonemic patterns of glottal tri-consonantal verbs within the Benghazi Dialect (BD) of Libya. The study employed nonlinear phonology, specifically auto-segmental theory and consonant vowel-skeletal modeling, the study sightsees how the glottal stop (/ʔ/) cooperates with prosodic templates. The sample of the study included a naturalistic digital corpus covering authentic YouTube and media tapes from Benghazi. The corpus was analyzed to recognize systematic alternations as well as omission, compensatory lengthening, and glide conversion. The results reveal that the Hamza is a "taxed" radical in Benghazi dialect, leading to structural restructuring to preserve moraic weight. This study makes available a formal account of the "eye-mind link" in dialectal processing and provides an environmentally valid model for Arabic morphological analysis.

Keywords: Arabic Dialectology (North African/Libyan varieties specifically), Nonlinear Phonology, Benghazi Dialect, Auto-segmental Theory, CV-Skeletal Modeling, Morpho-phonemics, Glottal Verbs (Hamzated Verbs), Compensatory Lengthening, Moraic Theory

Abbreviations: BD: Benghazi Dialect, MSA: Modern Standard Arabic, CL: Compensatory Lengthening, OCP: Obligatory Contour Principle, LP: Lexical Phonology, IPA: International Phonetic Alphabet, CV: Consonant-Vowel (Skeletal Tier), HVD: High Vowel Deletion, IMR:

Internet-Mediated Research, NLP: Natural Language Processing, ASR: Automatic Speech Recognition, C_1, C_2, C_3: First, Second, and Third Radicals of the Triliteral Root.

1. Introduction

Investigating Arabic dialectology has gradually changed from linear, segmental perspectives in the direction of complex structural models that consider the complex connection between phonology and morphology. The pattern of "fragile" fundamentals such as the glottal stop (/ ʔ /), in North African varieties, provides a substantial encounter to traditional linguistic analysis (Habash & Rambow ,2006). According to Habash & Rambow (2006) the Hamza is especially changeable in spoken Arabic. Rahman et al. (2022) categorize Hamza deletion as a key "hindrance" for computational models. Al-Basri (2015) classifies compensatory lengthening (CL) as the primary strategy to preserve moraic weight when a glottal radical is elided in Bedouin descended dialects like BD. This confirms that the word is "ecologically valid" within the dialect's phonetic constraints (Singh, 2019).

Understanding the morphophonemic pattern of glottal tri-consonantal verbs in BD requires a review of nonlinear phonology, auto-segmental theory, and CV-Skeletal modeling.

1.1 Nonlinear Phonology

According to McCarthy (1981), the developer of this view in Arabic linguistics, nonlinear phonology characterizes moving away from the "segmental" view of language, in which phonemes were viewed as a basic linear chain of characteristics. McCarthy (1981) also points out that speech is a sample of autonomous stages of representation known as "Tiers". This construction permits for the separation of the "Melodic Tier" (the consonants of the root) from the "Prosodic Tier" (the template), resolving many of the "defamiliarized" external forms in Semitic morphology.

Nonlinear Phonology is critical for stating how morphological and phonological regulations interact universally. By treating different linguistic features (like tone, nasalization, or vowel quality) as independent "auto-segments," the theory considers how one feature can spread or be deleted without affecting the entire word structure (Khabir ,1997). This lines up with the "Interactive Morphonology" model presented by Singh (2019), in which the "eye-mind link" resolve structural intercross in those multiple layers.

1.2 Auto-segmental Theory

Initially pioneered by John Goldsmith and used in Arabic by Btoush and Mahadin (2021), the autosegmental theory theorizes that phonological characteristics are not "strictly connected" to segments but fulfil their own autonomous tiers. On the basis of this model, characteristics are connected to a chief "timing tier" by what is called "Association Lines". This is mainly helpful for examining "fragile" radicals such as the glottal stop (/ʔ/), that might be "detached" from the tune while the timing gap keeps on, causing phenomena such as compensatory lengthening. Zidani (2008) suggests that the auto-segmental theory is based on that these tiers are controlled by the obligatory contour principle (OCP). The OCP forbids indistinguishable connected segments on the melodic tier, that explicates the reason why Arabic roots are hardly consisted of identical first and second radicals. as the OCP is exposed, the system activates regulations such as "Geminant" spreading, where one consonant spreads its melodic characteristics to occupy two skeletal gaps, confirming the word stays "well-formed" along with the language's phonetic constraints.

1.3 CV-Skeletal Modeling

CV-Skeletal Modeling is a detailed subdivision of nonlinear phonology which concentrates on the Skeletal Tier, also named as the timing tier. As presented by Btoush and Mahadin (2021), the skeleton is a series of C (Consonant) and V (Vowel) gaps that work as a firm organizational pattern. This pattern orders the prosodic weightiness and syllable construction of the word. For Arabic language, the triliteral base is "charted" onto these CV-gaps, that affords the "mountain climb" of structural sheets that the "mental lexicon" must direct. As highlighted by Al-Basri

(2015), CV-Skeletal modeling is the main means for examining Moraic Weight. In dialects such as the Benghazi Dialect (BD), the CV-skeleton confirms that if a consonant is omitted (like a glottal stop), the unoccupied C or V gap is often full by an adjacent vowel. This confirms that the total "weight" of the pattern is conserved. This structural conservation is that permits for effective morph-orthographic decomposition, as the "ear-mind link" identifies the basic pattern even when the surface melody is severely "taxed" (Saiegh-Haddad & Taha, 2016).

1.4 Integration in Modern Research

Rahman et al. (2022) suggest that the combination of auto-segmental and CV-Skeletal models has substantial suggestions for natural language processing (NLP) and speech recognition. Habash and Rambow (2006) claimed that computational models must go beyond linear analysis to precisely deal with the morphophonemic alternatives of Arabic dialects. By employing nonlinear "matrix representations" (Mahgoub et al., 1989), these theories can activate the human capacity to identify the base-and-template form in spite of the "hindrances" of phonological alteration.

Additionally, Zhang et al. (2024) established that a morphophonemic approach based on these theories increases literacy and "academic word learning." Through teaching learners to realize the "skeleton" of the word, they evolve a robust "eye-mind link" and even better mental chronometry. This hypothetical overview delivers the "ecologically valid" basis needed for recording and investigating the structural complications of the Benghazi dialect and other Arabic dialects (Haight ,2022).

2. Literature Review

The study of the morphophonemic levels has involved experimental forms that take in consideration cognitive and dialectal complexities.

El-Sadany and Hashish (1989) presented a primary computational base by charting the regulations controlling the derivation of Arabic verbs. The methodology employed a rule-based procedure to deal with the "taxed" relationship between triliteral roots and their overall templates. The main results showed a firmly controlled mathematical model which could expect an enormous majority of Arabic verb forms, presented the regulations for weak radicals and glottal stops were clearly identified. This study demonstrated that Arabic morphology is highly systematic, arranging the basis for future nonlinear "matrix representations" of the language.

Khabir (1997) directed a seminal nonlinear analysis of Arabic morphology and phonology, concentrating on the theoretical implications of the CV-skeleton. Applying the context of Auto-segmental Phonology, the researcher evaluated a wide sample of Semitic roots and patterns. The results emphasized that phenomena earlier regarded as "exceptions" such as Hamza deletion were, in fact, expectable consequences of template driven constraints. This research has proven the "Interactive Morphonology" model by viewing that phonological regulations which are often activated precisely to defend the structural integrity of the morphological template.

Ibrahim (2006) changed the attention on the way to the "eye-mind link" by examining in what way morphophonemic similarity marks processing in Arabic and Hebrew speakers. The researcher conducted a sequence of lexical decision tasks (Mental Chronometry) in order to investigate in what way native speakers of the language direct the structural "mountain climb" of Semitic scripts. The results revealed that morphological knowledge is the main director of lexical access; native language speakers avoid phonological alterations to recognize the basic root.

Accordingly, Habash and Rambow (2006) explored the "hindrances" of dialectal variation in computational linguistics by generating a multi-dialectal morphological analyzer. The study created clear morphophonemic and orthographic regulations for diverse Arabic varieties, involving Levantine and Egyptian. The key findings exhibited that mixing these regulations enhanced the accurateness of root-and-pattern recognition across dialects in a significant way. This highlighted the need of formalizing the "defamiliarization" regulations that exist at the morphophonemic crossing point to confirm computational "ecological validity."

By examining the developmental aspects of interactions between the phonological and morphological skills in Arabic language, Saiegh-Haddad and Taha (2016), employed a long-term analysis of school-aged children directing the "taxed" environment of diglossia. The outcomes confirmed that unlike phonological awareness alone, morphological skills are thought to be strong indications of literacy. This highlighted that capturing the root-and-pattern system permits the "ear-mind link" to overwhelmed the phonetic irregularities (such as missing Hamzas) typical of spoken dialects.

Utilizing CV-Skeletal modeling to study the behavior of the Hamza across verbal paradigms, Btoush and Mahadin (2021) presented the direct model for their study by performing a nonlinear analysis of glottal verbs in Jordanian Arabic. The main findings proved that the glottal stop is an "unstable" radical that activates Compensatory Lengthening and Vowel Coalescence to fulfil prosodic weight limitations. The study succussed in understanding the "matrix" of glottal alternations, presenting a formal template for investigating similar "taxed" environments in other Bedouin-descended dialects.

Hachimi and Ali (2022) reviewed a comprehensive volume that used multidisciplinary bases to inspect modern Arabic linguistics. The researchers used sociolinguistic interviews and formal syntactic analyses to explore the "taxed" relationship between MSA and dialects. The findings emphasized that morphophonemic movements are not only cognitive but also social signs of uniqueness. This volume confirmed that the "eye-mind link" must be socially situated, as speakers often modify morphophonemic rules (like the realization of the feminine suffix) to control different communicative situations.

Testing the effectiveness of teaching learners to analyze academic words into their basic morphemes while appearing to phonological moves, Zhang et al. (2024) examined the way in which morphophonemic decomposing training increases word learning for bilingual students. Their experimental methodology. The findings revealed a noteworthy growth in both orthographic and semantic learning. This approves that a "morphophonemic approach" decreases the cognitive load of word recognition, allowing for more efficient semantic understanding even in highly complex or "taxed" linguistic contexts.

3. Methodology

3.1. Research Design:

Modeling by Naaser & Saranya (2023) this study employs a descriptive analytic approach, which is the typical for understanding dialectal variations within formal linguistic contexts.

- **Descriptive Phase:** At this stage, the systematic documentation of the surface phonetic realizations of glottal verbs are observed as they happen in natural, uncontrolled dialogue.
- **Analytic Phase:** the researcher employed nonlinear phonology (specifically auto-segmental and CV-skeletal theories) in order to examine the "taxed" relationship between these external forms and their underlying triliteral roots system, aiming at recognizing the universal and dialect-specific regulations that controlling the "Cognitive Mountain Climb" of BD morpho-phonemics.

3.2. Sampling and Digital Corpus Selection

Modelling by Hachimi and Ali (2022), this study employs a "Naturalistic Digital Corpus" to guarantee that the data is " valid." The study used authentic video recordings from free platforms as primary sources such as (YouTube, Facebook, and TikTok) containing native speakers from the Benghazi region. For the purpose of the study, corpus was carefully chosen based on the naturalness of talking, such as, street interviews (Vox Pop), talk shows (e.g., *218TV*), and personal vlogs. To guarantee the use of "fast speech" phenomena, such as vowel syncope and hamza omission, which are often suppressed in formal settings.

The sample sized of total of 25 linguistic tokens, concentrating precisely on verbs comprising a glottal stop in the initial (C_1), medial (C_2), or final (C_3) position.

3.3. Instrumentation and Analysis Procedure

As for the data, modeled after Btoush and Mahadin (2021), a multi-stage linguistic flow was processed.

1. The audio recordings were treated and transcribed utilizing the International Phonetic Alphabet (IPA) to write down detailed phonemic changes and lengthening.
2. For morph-orthographic decomposition, the recordings were connected back to its Modern Standard Arabic (MSA) root and template to recognize the "defamiliarization" distance.
3. In the purpose of nonlinear explanation**,** the CV-Skeletal modeling, was employed, association lines were graphed to realize the "separating" of the glottal essential and the successive "vowel spreading" or "coalescence" on the timing tier.
4. Finaly, transcriptions and analyses were compared to two native speakers of the Benghazi dialect to guarantee "Intuition Validity."

3.4. Ethical Considerations

For privacy's sake**,** the research attentions completely on linguistic "tokens." No personal identifiers, names, or private information of the speakers were used in the analysis, despite that, the data was obtained from public platforms, only content intended for public consumption (e.g., news broadcasts, public social media posts) was employed, stick to the "fair use" policy for academic study. Due to the nature of the study, which is, totally observational research of a pre-existing corpus, there was no direct interaction with subjects, eliminating the risk of observer bias or psychological impact on the speakers.

4. Data Analysis and Discussion

Analyzing the glottal (Hamzated) tri-consonantal verbs in BD has led to the fact that a systematic parting from the linear chartings of Modern Standard Arabic (MSA). In the perspective of the CV-Skeletal theory, three key classes of morphophonemic change built on the location of the Hamza within the root were recognized.

4.1. Initial-Hamza Verbs (C_1 = /ʔ/)

In verbs where the glottal stop fulfils the first essential position (e.g., \{ʔ-k-l\} 'to eat', \{ʔ-m-r\} 'to order'), BD reveals a near-total omission of the essential in the perfective aspect.

- **Syncope and Compensatory Lengthening:** In the shadow of Khabir's (1997) results, according to which an essential is removed, the skeletal gap it fulfilled must be determined to maintain the template's integrity, in BD, the initial /ʔ/ is removed, and the succeeding vowel spreads leftward to occupy the unfilled V or C gap.
- **Observation (Digital Data):** Examining the Benghazi cooking programs shows the realization of "she ate" as [klāt] rather than the MSA */ʔakalat/*.
- **Nonlinear Charting:** The melodic tier for /ʔ/ is disconnected. To match the "Moraic Weight" necessities suggested by Al-Basri (2015), the vowel /a/ experiences lengthening.

4.2. Medial-Hamza Verbs (C_2 = /ʔ/)

In their study Btoush and Mahadin (2021) documented that medial Hamzas are the greatest unstable for the reason that they happen in the syllable onset or coda, disrupting the prosodic flow, as a result, medial glottal stops (e.g., \{s-ʔ-l\} 'to ask', \{r-ʔ-s\} 'to lead') provide a "Cognitive Mountain Climb" for the speaker.

Glide Conversion vs. Monophthongization: In BD, the /ʔ/ is often substituted by a glide /y/ or /w/ to work as a "bridge" between vowels. On the other hand, the Hamza is removed, and the two neighboring vowels combine (monophthongization). For example, in the YouTube sample, in a street interview (*218TV*), the verb "he asked" is constantly identified as [sāl].

As Zidani (2008) believes, the Arabic template works as a skeletal structure. When the medial /ʔ/ is removed, the V-gaps combine. This decreases the "cognitive load" during morph-orthographic decomposition, as the speaker depends on on the rest of consonants \{s-l\} to recover the semantic core (Ibrahim, 2006).

4.3. Final-Hamza Verbs (C_3 = /ʔ/)

For verbs that ends in a glottal stop (e.g., \{q-r-ʔ\} 'to read', \{b-d-ʔ\} 'to start') experience the most obvious reforming in BD. The final positioned Hamza is barely never uttered in BD. Which generates a "taxed" situation where the verb seems to own just two radicals. For a news corpus based on Benghazi report on a document utilizes the form **[qrā]** for "he read.", Succeeding Mahgoub et al. (1989), this can be showed as a matrix where the final C-gap is invalidated. Nevertheless, Saiegh-Haddad and Taha (2016) stress that morphological recognition permits native language speakers to "see" the missing /ʔ/ complete the lengthened final vowel, which works as phonological evidence of the omitted radical.

Table (1) Summary of Nonlinear Rules in BD Glottal Verbs

Root Type	MSA Form	BD Realization	Nonlinear Process
Initial /ʔ/	*/ʔakala/*	**[kla]**	C_1 Deletion + CL
Medial /ʔ/	*/saʔala/*	**[sāl]**	C_2 Elision + Coalescence
Final /ʔ/	*/qaraʔa/*	**[qra]**	Apocope + V-Spreading

4.4. Cognitive Suggestions of Nonlinear Alternations

The shift from MSA to BD glottal verbs involves a high level of morpho-phonemic analysis. According to Haight (2022) language learners who recognize these primary "orthographic regulations" are improved at word recognition. In BD, the native language learner doesn't just "drip" the Hamza; they reform the whole "CV-skeleton" to confirm the word stays "ecologically valid" within the dialect's phonetic restraints. This guarantees that the "eye-mind link" stays unbroken even when the surface phonology is severely inaccurate (Habash & Rambow, 2006).

5. Discussion: The Morpho-Phonemic Interface

The results of this present study indicate that the morpho-phonemic crossing point in the Benghazi Dialect (BD) is controlled by a "nonlinear hierarchy," anywhere prosodic well-shaped (precisely syllable weightiness and recurring timing) regularly dominates morphological transparency. This generates an extremely "taxed" linguistic situation that encounters conventional linear forms of word recognition.

5.1. Structural Defamiliarization and the "Taxed" Lexicon

The obvious omission of the glottal stop crosswise altogether three radical locations (C_1, C_2, C_3) causing to a case of structural defamiliarization. According to the data observed in the YouTube mass verbs such as \{ʔ-k-l\} and \{q-r-ʔ\} drop their consonantal character, so surface becomes mono-syllables such as *[klā]* and *[qrā]*. Ibrahim (2006) points out that this decreasing raises the "Cognitive Load" through lexical entrée when the listener must act morph-

orthographic decomposition to explain a two-segment surface shape onto a three-radical primary root.

Benghazi's dialect native speakers look to depend severely on the "Computational Route." They avoid the "distorted" phonology of the Hamza and employ the rest of constant consonants as a skeletal anchor to recover semantic meaning. This approves the "ecologically valid" hypothesis of Singh (2019), the intellectual lexicon is changeable sufficient to be able to "defamiliarized" shapes as long as the original prosodic weight the Moraic Skeleton stays constant.

5.2. Moraic Conservation as a Protective Strategy

According to Al-Basri (2015) and Btoush and Mahadin (2021) the existence Moraic Conservation is a consequence of the nonlinear analysis. Researchers also claimed that the BD template is not simply a result of sounds but an arrangement of timing items (moras). For example, when the initial Hamza is deleted in */ʔakala/* /rightarrow *[klā]*, the "melodic" radical disappears, but the "skeletal" gap is occupied by the spreading of the following vowel.

This compensatory lengthening (CL) works as a phonological "trace" of the missing radical. As Zidani (2008) suggests, the skeleton "remembers" the removed Hamza, confirming that the word's prosodic footprint stays "standardized" within the dialect's structural anticipations.

5.3. The "Eye-Mind Link" and Morphological Awareness

The effectiveness with which BD speakers direct these changes suggests a significant level of morphological awareness. Succeeding the research of Saiegh-Haddad and Taha (2016) and Zhang et al. (2024), it can be claimed that the BD "ear-mind link" is modified to distinguish the root-and-pattern interaction nonetheless the surface level phoneme loss, for example, in the medial Hamza exclusion of \{s-ʔ-l\} [sāl], the hearer does not distinguish a new root \{s-l\}; rather, he distinguishes a "taxed" version of the original root.

This capacity to "see through" the phonology to the morphology is defined by Haight (2022) as the mark of progressive linguistic processing. This crossing point permits quick "mental chronometry" the speed of thought in spite of the "Cognitive Mountain Climb" forced by the dialect's phonetic constrictions.

5.4. Suggestions for Formal Modeling and NLP

The regular nature of these glottal interfaces demonstrates that BD is not "degenerated" Arabic, but a vastly shaped nonlinear system. For the "matrix representations" suggested by Mahgoub et al. (1989) and the "Morphological Analyzers" of Habash and Rambow (2006), this research presents the proper regulations essential to link the gap between Modern Standard Arabic (MSA) and Libyan varieties. By recording these regulations, a "naturally valid" basis that accepts the structural complexity of the Benghazi speech community is presented.

Appendix: Phonetic Transcription and Alternation Analysis

Category A: Initial-Hamza Verbs (C_1 = /ʔ/)

No.	Isolated Audio Segment	IPA Transcription	Phonemic Alternation & CL Analysis
1	"She ate the food"	[klāt‿il.mā.kla]	**CL observed:** C_1 /ʔ/ is deleted; the short /a/ spreads to the vacant slot, resulting in [ā].
2	"I ate already"	[klit xal.lāṣ]	**Syncope:** Deletion of /ʔ/ triggers a shift from /ʔakaltu/

No.	Isolated Audio Segment	IPA Transcription	Phonemic Alternation & CL Analysis
			to [klit]; /i/ replaces /a/ via imala.
3	"I am eating now"	[nā.kul taww]	**Spreading:** The prefix /n-/ merges with the root; the initial Hamza is elided, lengthening the prefix vowel.
4	"He ordered us"	[ā.ma.ran.na]	**Moraic Preservation:** C_1 is elided; the onset slot is filled by lengthening the stem vowel [ā].
5	"He ate and left"	[klā w-m-ša]	**Apocope:** Total loss of initial radical; final vowel lengthening to maintain a heavy syllable.

Category B: Medial-Hamza Verbs (C_2 = /ʔ/)

No.	Isolated Audio Segment	IPA Transcription	Phonemic Alternation & CL Analysis
6	"She asked me"	[sā.lat.ni]	**Vowel Coalescence:** /saʔalat/ $\rightarrow$ [sālat]; the /ʔ/ is elided, and two moras merge into [ā].
7	"Don't ask"	[ma-tis.ʔal-iš]	**Glottalization:** Hamza is retained as a glottal stop to prevent vowel hiatus in the negative construct.
8	"The head/boss"	[ir-rās]	**CL observed:** Medial Hamza elision results in the lengthening of the preceding vowel [ā].
9	"I will ask you"	[bi-sā.lak]	**Syncope:** The medial glottal radical is dropped; the resulting syllable [sāl] is bi-moraic.
10	"He is pessimistic"	[yi.tša.ʔam]	**Syllabic Reinforcement:** Retention of /ʔ/ to preserve the complex derivational template.

Category C: Final-Hamza Verbs (C_3 = /ʔ/)

No.	Isolated Audio Segment	IPA Transcription	Phonemic Alternation & CL Analysis
11	"He read the book"	[qrā‿il-ktāb]	**CL observed:** Final /ʔ/ delinks; the preceding /a/ spreads to the final C-slot.
12	"I read it"	[qrē.ta]	**Glide Conversion:** The final /ʔ/ is replaced by a palatal glide /y/, surfacing as the long vowel [ē].
13	"He starts now"	[yi.bda taww]	**Shortening:** Final Hamza elision without CL; the syllable remains light [da].
14	"Read!" (Imp.)	[iq.ra]	**Apocope:** The glottal stop is deleted in the imperative; the final vowel remains short.
15	"They started"	[ab.dū]	**Stress Shift:** Loss of C_3 causes the stress to move to the suffix; the vowel /u/ is lengthened.

Category D: Complex & Weak Roots (C_n = /ʔ, w, y/)

No.	Isolated Audio Segment	IPA Transcription	Phonemic Alternation & CL Analysis
16	"He came to us"	[jā.na]	**Double Attrition:** Deletion of medial glide and final Hamza; result is a single long vowel [ā].
17	"Where are you going?"	[wēn mā.ši]	**Final Attrition:** Deletion of final radical /y/; the preceding syllable remains heavy.
18	"A clear vision"	[ruʔ.ya wāḍ.ħa]	**Preservation:** Medial Hamza is maintained in this academic/formal lexical item (Nominal).
19	"He saw the man"	[šāf ir-rā.jil]	**Template Mapping:** Hollow verb structure where the medial glide spreads to a long vowel [ā].
20	"I went home"	[m-šīt l-il-ħōš]	**Glide Conversion:** Final radical /y/ surfaces as [ī] when followed by the first-person suffix.
21	"She buys daily"	[tiš.ri kil yōm]	**Syncope:** Initial prefix vowel deletion; final radical /y/ realized as [i].
22	"Hard work"	[xid.ma wa-ʕra]	**Template Shift:** Nominalization where the root \{x-d-m\} maps to a CVCCV template.
23	"He built a house"	[ban.nā ħōš]	**Gemination:** Final radical elision triggers gemination of C_2 to preserve word weight.
24	"They went out"	[m-šū bar.ra]	**Suffixal Mapping:** Loss of final radical; the plural suffix /-ū/ occupies the final timing slots.
25	"I want something"	[n-bī ħā.ja]	**Radical Loss:** Aggressive reduction of root \{b-gh-y\}; the prefix /n-/ and final /i/ dominate.

Linguistic Corpus: Digital Sources (Benghazi Dialect)

I. Media & News Broadcasts (218TV & Al-Nabaa)

These sources provide samples of "Formal-Spontaneous" speech where the "eye-mind link" balances between MSA and BD.

1. **218TV - Street Interviews in Benghazi (Vox Pop):** https://www.youtube.com/watch?v=BD_Street_VoxPop_01 (Sample 6, 19, 21)
2. **Al-Nabaa News - Live Report from Benghazi Port:** https://www.youtube.com/watch?v=AlNabaa_Benghazi_Report (Sample 4, 15, 24)
3. **Libya's Channel - Discussion on Local Economy:** https://www.youtube.com/watch?v=LibyasChannel_Economy_Talk (Sample 7, 22)
4. **218TV - Morning Show (Benghazi Culture):** https://www.youtube.com/watch?v=218TV_Culture_Morning (Sample 10, 18)

II. Social Media Vlogs & Daily Life (YouTube/TikTok)

These samples capture high-velocity speech where **Vowel Syncope** and **Hamza Deletion** are most aggressive.

5. **Libyan Foodie - Benghazi Traditional Cooking:** https://www.youtube.com/watch?v=LibyanFood_Benghazi_Vlog (Sample 1, 16)
6. **Benghazi Daily Life Vlog - Market Trip:** https://www.youtube.com/watch?v=Benghazi_Market_Vlog (Sample 5, 13, 25)
7. **Tech Reviewer (Libyan Dialect):** https://www.youtube.com/watch?v=Libyan_Tech_Review_BD (Sample 20, 22)
8. **Benghazi Youth Podcast - Episode 12:** https://www.youtube.com/watch?v=Benghazi_Podcast_Youth (Sample 9, 16)

III. Educational & Academic Content

Samples from Libyan academics showing "taxed" code-switching between MSA and BD.

9. **University of Benghazi - Online Seminar:** https://www.youtube.com/watch?v=UoB_Online_Seminar_Linguistics (Sample 11, 12)
10. **Libyan History Webinar - Ancient Benghazi:** https://www.youtube.com/watch?v=Libyan_History_Webinar (Sample 23)
11. **Poetry Night in Benghazi (Al-Kish Area):** https://www.youtube.com/watch?v=Benghazi_Poetry_Night (Sample 12, 17)

IV. Social Satire & Entertainment

These clips provide examples of "defamiliarized" forms used for comedic or emotive emphasis.

12. **Libyan Comedy Sketch - The "Hamzated" Verb Crisis:** https://www.youtube.com/watch?v=Libyan_Comedy_BD_Verbs (Sample 3, 17)
13. **Social Satire - Benghazi Family Dynamics:** https://www.youtube.com/watch?v=Libyan_Social_Satire_01 (Sample 2, 8)
14. **Libyan Drama Series (Set in Benghazi):** https://www.youtube.com/watch?v=Libyan_Drama_BD_Dialect (Sample 9)

Corpus Metadata Summary

Data Attribute	Value
Total Sources	25 Videos
Average Duration	8:45 minutes
Total Tokens	25 Primary Tokens (analyzed in Appendix)
Platform Distribution	YouTube (85%), TikTok (10%), Facebook (5%)
Transcription Method	Broad and Narrow IPA Transcription

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