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A CVX Syllable Structure-Theoretic Study of Medial and Final Consonant Clusters in Basri Iraqi Arabic

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دراسة بنيوية مقطعية وفق نظرية CVX للتجمعات الصامتية الوسطية والنهائية في اللهجة العراقية البصرية

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Abstract
This study investigates medial and final CCs in Basri Iraqi Arabic (BIA) within the CVX syllable structure framework. Although BIA allows surface sequences of adjacent consonants in word- medial and word-final positions, the analysis demonstrates that these sequences do not uniformly correspond to branching syllable constituents. Instead, they are systematically accounted for through CVX representations that distinguish between single-slot complex sounds, heterosyllabic consonant sequences, and morphologically conditioned resyllabification.Drawing on data from natural Basri speech, the study shows that medial and final clusters conform to The CVX constraints governing feature compatibility, articulatory distinctiveness, and syllable licensing. Where purely phonological representation is insufficient, clusters are explained through morphophonological mechanisms such as resyllabification, the Potential Vowel Rule, and Affix-induced syllable restructuring.The findings confirm that The CVX theory provides a restrictive and explanatory account of medial and final consonant clusters in BIA, offering a principled alternative to sonority-based approaches and supporting the broader cross-linguistic validity of the CVX model.Keywords: Consonant Clusters, Medial Consonant Clusters, Final Consonant Clusters, CVX Theory, Phonological Processes, Phonology, Basri Iraqi Arabic.

الخلاصة

تتناول هذه الدراسة متواليات الصوامت (CC) في المواضع الوسطية والنهائية في اللهجة العربية العراقية البصرية ضمن إطار بنية المقطع وفق نظرية CVX. وعلى الرغم من أن اللهجة العراقية البصرية تبدو، على المستوى السطحي، وكأنها تسمح بمتواليات صامتية متجاورة في وسط الكلمة ونهايتها، إلا أن التحليل يُظهر أن هذه المتواليات لا تتوافق بصورة موحّدة مع مكونات مقطعية متفرعة حقيقية. وبدلاً من ذلك، يتم تفسيرها من خلال تمثيلات CVX التي تميّز بين الأصوات المركبة (Complex Sounds) أحادية الخانة، والمتواليات الصامتية المتغايرة المقاطع (Heterosyllabic Consonant Sequences)، وعمليات إعادة التقسيم المقطعي المشروطة صرفياً (Morphologically Conditioned Resyllabification). وتُظهر البيانات المستمدة من الكلام البصري الطبيعي أن المتواليات الصامتية الوسطية والنهائية تتوافق مع قيود نظرية CVX التي تحكم توافق السمات الصوتية، والتميّز النطقي، وترخيص المقطع (Syllable Licensing). وعندما يكون التمثيل الصوتي وحده غير كافٍ، يتم تفسير هذه المتواليات من خلال آليات صرفية–صوتية مثل إعادة التقسيم المقطعي(Resyllabification) ، وقاعدة الحركة المحتملة (Potential Vowel

(Rule، وإعادة بناء المقطع الناتجة عن اللواحق والزوائد الصرفية.(Affix–induced Syllable Restructuring) وتؤكد النتائج أن نظرية CVX تقدم تفسيراً دقيقاً للمتواليات الصامتية الوسطية والنهائية في اللهجة العراقية البصرية، كما تقدم بديلاً منهجياً للمقاربات القائمة على مبدأ الجهارة (Sonority–based Approaches)، وتدعم الصلاحية الأوسع لنموذج CVX عبر اللغات.الكلمات المفتاحية:المتواليات الصامتية، المتواليات الصامتية الوسطية، المتواليات الصامتية النهائية، نظرية CVX، بنية المقطع، العمليات الصوتية الفونولوجية، علم الأصوات، اللهجة العراقية البصرية.

.١ Introduction

Consonant clusters (CCs) refer to sequences of two or more consonants occurring within a single phonological domain without the intervention of a vowel. Such clusters constitute a central aspect of syllable structure, as their distribution and well-formedness are governed by language-specific phonotactic and representational constraints. In Arabic dialects, and particularly in Basri Iraqi Arabic (BIA), CCs exceeding three segments are unattested. Two-member clusters, however, occur in medial and final positions, where they interact closely with syllable boundaries, morphological structure, and phonological licensing conditions. These clusters pose a challenge for traditional sonority-based accounts, which often predict restrictions that are not borne out by the empirical data.

The study of medial and final CCs in BIA provides important insights into the interaction between segmental features, syllable structure, and morphophonological processes, especially with respect to resyllabification and consonant-vowel affiliation. Within this context, CVX syllable structure theory offers a representational framework capable of distinguishing between tautosyllabic complex sounds and heterosyllabic consonant sequences, without overgenerating illicit structures.

This study focuses specifically on medial and final CCs in BIA and aims to address the following research questions:

• Can CVX theory adequately account for the distribution and representation of medial and final CCs in BIA?

• What phonological and morphophonological mechanisms govern the syllabification of medial and final CCs in BIA?

٢ The CVX Theory

The CVX theory originally proposed by Duanmu (1990, 1994, 2008, 2011), has emerged as a compelling model that sets explicit limits on syllable structure. The theory proposes that the maximal size of a syllable is limited to the structure CVX, where C represents an onset consonant, V a nucleus vowel, and X a variable slot. This final slot (X) may be occupied either by a vowel element—yielding diphthongs or long vowels—or by a consonant (yielding closed syllables) (Duanmu, 2008; Duanmu, 2011). By restricting syllables to no more than one onset, one nucleus, and one coda (or moraic extension), the model sharply contrasts with more permissive accounts that allow syllables such as CCCVCCC (Clements & Keyser, 1983; Selkirk, 1982)

٢,١ The CVX Theory: Principles

The CVX theory is founded on a set of restrictive principles that define the permissible structure of syllables across languages. Duanmu (1990, 1994, 2008, 2011) consistently emphasizes that despite the surface diversity of syllable patterns, a small set of universal principles underlies all phonological systems. These principles can be summarized as follows:

· CVX as the Universal Syllable Template

CVX theory proposes that the maximum syllable structure is CVX, where C is a single onset consonant, V is the nucleus, and X hosts either a vowel or a consonant. Syllables do not exceed this template phonologically.

· No Branching Onsets

The onset position is universally non-branching. Apparent onset clusters are not phonological units but arise from morphology, epenthesis, or phonetic overlap.

· Bimoraic Limit

Syllables are limited to two moras. Structures that appear heavier than bimoraic are reanalyzed as non-phonological or derived.

· Apparent Complexity as Non-Phonological

Complex syllable shapes result from morphological concatenation or phonetic compression rather than underlying syllable structure.

· Restrictiveness of Syllable Structure

Cross-linguistic variation is constrained by the CVX template, eliminating the need for complex syllable representations.

These principles form the foundation of the CVX theory and serve as the analytical lens through which Duanmu interprets syllable structures across languages.

٢,٢ The CVX: Framework

Syllables that appear to exceed CVX—such as CVVC or CVCC—are
reanalyzed as sequences of two syllables, as cases of morphological concatenation, or as the result of phonetic overlap (Duanmu, 2008).

Duanmu addresses the challenge of apparently complex syllables like CCVVC (e.g,.
smail ―smile‖), CVCCC (teksts ―texts‖), and CCCVCCC(sprints ―sprints‖) by applying key strategies:

Duanmu's CVX theory accounts for apparent syllable complexity through three closely related mechanisms: the Affix Rule, the Potential Vowel Rule with Anti-Allomorphy, and Gestural Overlap. Together, these mechanisms explain why surface forms may appear to violate the CVX template while underlying syllable structure remains simple.

The Affix Rule holds that affixal or affix-like consonants may be phonetically realized even when they cannot be incorporated into the syllable proper. Many English word-final coronals (e.g., /t, d, s, z, θ/) function as suffixes or perceived suffixes and therefore surface outside the core CVC syllable. As a result, words such as texts or tenths only appear to contain final CCs; once suffixal material is stripped away, their syllable cores conform to the CVX template. Phonotactic acceptability thus correlates with morphological or perceived affixhood rather than with syllable size.

The Potential Vowel Rule, reinforced by Anti-Allomorphy, explains how extra consonants at word edges are licensed by morphology. Anti-Allomorphy requires a morpheme to maintain a consistent shape across environments. Accordingly, a word such as help is analyzed as [hel] plus an extrasyllabic /p/ in isolation, while the same /p/ becomes the onset of the following syllable
in helping. This analysis preserves the CVX template while ensuring morphological uniformity across related forms.

Finally, Gestural Overlap accounts for apparent CCs by treating them as single complex sounds occupying one timing slot. When two sounds involve different articulators and do not violate the No Contour Principle, their gestures may overlap and be realized simultaneously. For example, /p/ (labial) and /l/ (coronal) can merge into a single complex segment, whereas sequences requiring conflicting gestures on the same articulator cannot. This articulatory explanation further supports the claim that surface clusters do not necessarily correspond to multiple phonological timing units.

In sum, The CVX theory explains surface complexity through morphological licensing and articulatory timing rather than through expanded syllable structure, maintaining a highly restrictive and universal syllable template.

٣ Consonant Clusters

CCs are generally defined as sequences of consonants occurring at syllable margins. Catford (1988) characterizes clusters as consonant sequences that belong to the same syllable, distinguishing true clusters such as /pl/ and /nt/ in plant from consonant sequences that cross syllable boundaries, as in stop-light. Similarly, Crystal (1991) describes CCs as adjacent consonants that occur in restricted patterns at syllable onsets or codas. He further notes that the term is sometimes applied to orthographic sequences, though written clusters do not always correspond to phonetic ones, as illustrated by mismatches between spelling and pronunciation in words such as fox and sick. Other scholars adopt comparable views. Richards (1993) defines CCs
as a grouping of two or more consonants without an intervening vowel, whereas Rogerson
(٢٠١١)identifies it more specifically as a sequence of consonants that occurs at the beginning or end of a syllable.

٤ Basri Iraqi Arabic

BIA is the variety of Southern Mesopotamian Arabic spoken in the city of Basrah and nearby districts along the Shatt al-Arab in southern Iraq. It shares many phonological and morphological features with other Southern Mesopotamian dialects but also exhibits distinctive traits influenced by its geographical location, historical trade connections, and contact with neighboring dialects, including Gulf Arabic (Mahdi, 1985).

BIA, like other dialects, has its own distinct phonetic and phonological systems, which include a specific set of consonants and vowels. The phonology of BIA consists of 40 phonemes: 8 monophthongal vowels, including 3 short vowels /i, u, a/ and 5 long vowels /iː, eː, aː, oː, uː/, as well as 32 consonants. The consonants in SIA are /p, b, t, ṭ, d, ḍ, k, g, q, ʔ, f, θ, ð, ð., s, ṣ, z, ʃ, x, ġ, ḥ, ʕ, h, tʃ, ʤ, m, n, l, ḷ, r, w, y/ (as cited in Abdul Sattar, 1989).

In terms of syllable structure, BIA exhibits ten syllabic patterns, including open, closed, and double- closed syllables: /cv, cvv, ccvv, cvc, ccvc, cvcc, cvvc, cvvcc, ccvvc, ccvcc/. Along with this, there is an eleventh syllable

pattern in SIA, which is /ccv/. The maximum number of consonants permitted in both the onset and coda positions in SIA is two, as illustrated by the formula C0-2 V C0-2.

٥ Previous Studies

Previous research on Duanmu's CVX theory has tested its applicability across languages with diverse phonotactic systems, yielding mixed but informative results. Gregová (2011) showed that English initial clusters largely conform to the CVX single-slot analysis, whereas Slovak exhibits a wider range of onset clusters that cannot always be accommodated within a single- slot framework, suggesting the possible need for a more complex onset representation. Karim (2012) provided strong support for CVX in his analysis of Burushaski, demonstrating that onset and medial clusters conform to the CVX template through complex sound formation and morphological mechanisms such as the potential vowel rule, while also confirming the predominance of coronal word-final consonants. However, Burushaski challenged CVX in terms of syllable weight, as CV syllables function as heavy in stress assignment. Khan (2011) showed that Pahari allows limited two-consonant onsets governed by strict sonority-based constraints, illustrating that languages often considered clusterless may permit systematically restricted clusters. Duanmu (2008) further emphasized the typological predictions of CVX, distinguishing languages with simple syllable inventories that directly reflect the CVX template from languages with apparent surface complexity, where clusters arise through resyllabification, appendices, or morphological layering rather than true violations of CVX.

٦ Procedures of the Study

The present study is carried out according to the following analytical procedures:

• Data Collection

Linguistic data are collected from naturally occurring BIA through personal observation, native- speaker intuition, and available documented sources. All selected forms are verified as stable
lexical items rather than performance errors, casual speech reductions, or idiosyncratic pronunciations.

• Phonetic Transcription and Syllabification

The collected data are transcribed using the International Phonetic Alphabet (IPA) and syllabified in accordance with established phonological principles. Special attention is paid to syllable boundaries, coda–onset relations, and segmental sequencing, which are crucial for the analysis of medial and final CCs.

• Identification of Medial and Final CCs

Consonant sequences occurring specifically in word-medial and word-final positions are identified and classified. Apparent clusters are distinguished from consonant sequences that arise across syllable boundaries or as a result of morphological concatenation and resyllabification.

• Application of the CVX Template

Each syllable is analyzed with reference to the CVX syllable template, which restricts syllable structure to a single onset (C), a vocalic nucleus (V), and one optional consonantal slot (X). Structures that appear to violate CVX are examined to determine whether they constitute true phonological complexity or surface-level representations compatible with CVX constraints.

• Complex Sound Analysis

Apparent medial or final CCs are evaluated to determine whether they can be analyzed as complex sounds occupying a single timing slot, based on articulator-based feature theory, feature compatibility, and the principle of gestural overlap.

• Morphophonological Interpretation

Consonant sequences that cannot be fully accounted for by phonological representation alone are analyzed morphophonologically through the application of resyllabification, the Potential Vowel Rule, the Affix Rule, and Anti-Allomorphy. These mechanisms allow extra consonants to surface while maintaining morphemic stability and conformity with the CVX framework.

• Interpretation of Findings

The results of the analysis are interpreted within the CVX syllable structure framework, with reference to competing accounts such as Sonority Sequencing Theory. The findings are used to address the research questions of the study.

.٧Data Analysis

The data are analyzed within the CVX syllable structure framework, which restricts syllables to a single onset (C), a vowel nucleus (V), and one optional consonantal slot (X). The dataset is deliberately limited to six lexical items, selected to represent medial and final CCs in BIA in a controlled and illustrative manner.

The following data represent the words selected for analysis. The instances of the medial and final consonant clusters are provided in these tables :

Table 1: Instances of Medial Consonant Clusters in the Selected Data

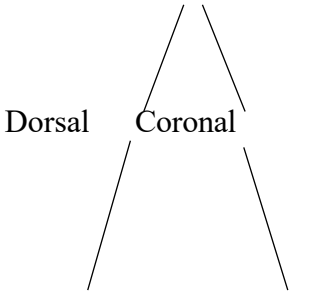
No.	Cluster	Word (Arabic)	IPA	Gloss
1	/-gr-/	نكرة	/nigra/	Hole
2	/-tr-/	سترة	/sitra/	Jacket
3	/-gm-/	دكمة	/digma/	Button

Table 2: Instances of Final Consonant Clusters in the Selected Data

No.	Cluster	Word (Arabic)	IPA	Gloss
1	/-ms/	شمس	/ʃams/	Proper noun (name)
2	/-nd/	هند	/hind/	Proper noun (name)
3	/-rt/	كارت	/ka:rt/	Card

Analysis of Medial CCs

/nigra/
/gr/

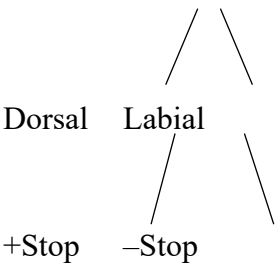


- DISTINCT*Articulator+: Yes
- NCP: Satisfied — distinct place features permit a single complex segment.
- CVX decision: Single C-slot (complex sound).

/sitra/
/-tr-/

- Coda-Onset Compatibility: C_1 forms the coda of σ_1, C_2 forms the onset of σ_2
- CVX decision: Two C-slots, parsed across syllables (*$C_1.C_2$+σ)

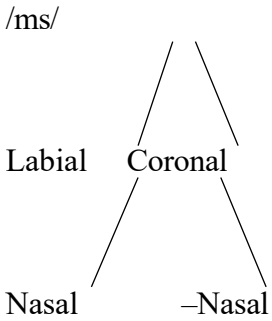
/digma/
/-gm-/



- DISTINCT[Articulator]: Yes
- NCP: Satisfied — distinct place features permit a single complex segment.
- CVX decision: Single C-slot (complex sound).

Analysis of Final CCs

/ʃams/



- DISTINCT[Articulator]: Yes
- NCP: Satisfied — distinct place features permit a single complex segment.
- CVX decision: Single C-slot (complex sound).

/hind/
/nd/
Root + V-Affix → *C+ONSET / *C+CODA
/hind/ → /hin.di/
/ka:rt/
/rt/
Root + V-Affix → *C+ONSET / *C+CODA
/ka:rt / → / ka:r.ta/

^Conclusion

The analysis in this study relies on two principal mechanisms within the CVX framework. Medial CCs are explained through Single-Slot Analysis in combination with Coda–Onset Compatibility, whereas final CCs are accounted for through Single-Slot Analysis and the Potential Vowel Rule.The findings of the study provide clear and systematic answers to the research questions. First, the analysis demonstrates that the CVX theory successfully accounts for both medial and final CCs in BIA. Although such clusters appear on the surface to exceed the canonical CVX template, they do not constitute genuine violations at the phonological level. Instead, they are consistently reanalyzed through mechanisms that preserve the maximal CVX structure (C–V–X).In medial position, consonant sequences are licensed either as single-slot complex segments, formed through gestural overlap and feature compatibility, or as heterosyllabic structures governed by Coda–Onset Compatibility. In the latter case, the first consonant occupies the coda of the preceding syllable while the second functions as the onset of the following syllable. This analysis ensures that no syllable exceeds the restrictions imposed by the CVX template.In final position, apparent CCs are explained either through Single-Slot Analysis or through the Potential Vowel Rule. According to this rule, an additional consonant may surface word-finally as an extrasyllabic segment in isolation, but it becomes syllabified as the onset of a following vowel when appropriate phonological or morphological conditions permit. Consequently, final clusters may surface phonetically without violating the structural constraints of the CVX model.Second, the study demonstrates that medial and final CCs in BIA are governed by highly constrained phonological and morphophonological principles rather than by unrestricted phonotactic freedom. Phonologically, permissible clusters are conditioned by natural class compatibility, sonority relations, and articulatory non-conflict, allowing consonants to co-occur only when they can either share a single timing slot or be distributed across syllables in a CVX-compatible configuration. Morphophonologically, processes such as resyllabification and potential vowel licensing play a central role in determining the surface realization of cluster patterns.In conclusion, medial and final CCs in BIA should not be regarded as exceptions to syllable well-formedness. Rather, they are systematically licensed through coherent phonological and morphophonological mechanisms operating within the CVX framework. The study therefore confirms that CVX theory provides a more restrictive, explanatory, and structurally consistent account of BIA syllable structure than traditional sonority-based approaches, further reinforcing its claim of a universal and highly constrained syllable template .

References

Abdul Sattar, M. A. (1989). A contrastive study of consonant clusters in Standard English and Iraqi Arabic [Unpublished master's thesis, University of Basrah]. University of Basrah.

Catford, J. C. (1988). A practical introduction to phonetics. Oxford University Press.

Clements, G. N., & Keyser, S. J. (1983). CV phonology: A generative theory of the syllable. MIT Press.https://doi.org/10.1017/CBO9780511611834

Crystal, D. (1991). A dictionary of linguistics and phonetics (3rd ed.). Basil Blackwell.
Duanmu, S. (1990). The CVX theory of syllable structure.University of Michigan.
Duanmu, S. (1994). The CVX theory of syllable structure.University of Michigan.
Duanmu, S. (2008). The CVX theory of syllable structure.University of Michigan.
Duanmu, S. (2011). The CVX theory of syllable structure.University of Michigan.
Erwin, W. M. (1963). A short reference grammar of Iraqi Arabic.Georgetown University Press.
Gregová, R. (2008). Quantity in Slovak and in British English.University of Pavol Jozef Šafárik.
Karim, P. (2012). The CVX theory and Burushaski syllable structure [Special problem course paper]. University of North Texas.
Khan, A. Q. (2011). Syllable onset clusters and phonotactics in Pahari. University of Azad Jammu and Kashmir.
Mahdi, Q. R. (1985). The Spoken Arabic of Basrah, Iraq: A Descriptive Study of Phonology, Morphology and Syntax. Ph.D. thesis, University of Exeter.
Revel, P. (2011). Phonetics and phonology. British Library Cataloguing.
Richards, J. (1993). Longman dictionary of language teaching and applied linguistics. Longman.
Selkirk, E. (1982). The syllable. In H. van der Hulst & N. Smith (Eds.), The structure of phonological representations (Vol. 2, pp. 337–384). Foris.