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ARTICLE

# Sonority Constraints in Frozen Jordanian Arabic Binomials

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## ABSTRACT

This study examines whether binomial constraints reflect universal linguistic trends or are influenced by language-specific factors, with a particular focus on phonological patterns in Jordanian Arabic binomials. Setting aside potential influences from semantics, pragmatics, morphology, word frequency, prosody, and cultural factors, the analysis centers on the applicability of onset and coda sonority constraints. While these principles are often associated with universal linguistic tendencies, examining a corpus comprising 400 frozen Jordanian Arabic binomials reveals that 60.25% of onset binomials and 67.33% of coda binomials deviate from expected sonority sequences. These deviations, manifesting as "reversals" (sonority inversion) and "plateaus" (sonority stagnation), challenge the universality of such principles and highlight context-specific and language-driven variability. Statistical analysis highlights pronounced patterns of non-conformity, indicating that universal applicability is more the exception than the rule. These findings underscore the need for further cross-linguistic research to investigate the interplay between universal trends and language-specific factors in binomial ordering.

***Keywords:*** Phonological Constraints; Language-Universal; Language-Specific; Onset and Coda Sonority; Jordanian Arabic; Binomials

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# 1. Introduction

Binomials, or word pairs, are sequences of two coordinated words, typically joined by a conjunction, that exhibit a fixed or preferred order. Cooper and Ross [1] were among the most influential scholars who investigated the principles governing binomial ordering, emphasizing the interplay of phonological constraints and semantic hierarchies. Far from being a mere philosophical quandary akin to the "chicken and egg" dilemma, the study of binomial ordering remains a pivotal area of inquiry in contemporary linguistic scholarship [2]. Researchers have investigated the phenomenon under different terms, including 'coordinates' [3], 'freezes or 'frozen binomials' [4], 'conjoined lexical pairs' [5], 'contrastive lexical couples' [6], and 'Siamese twins [7]. However, the term binomials in this paper will specifically refer to the 'frozen' or irreversible pairs, as introduced in Malkiel's seminal study on irreversible binomials [8], which are word pairs that consistently, or nearly always, appear in a fixed order [9].

Contemporary European studies have extensively investigated the reversibility of binomials [2, 10, 11]. However, as outlined in Section 3, the current state of research on Arabic binomials reveals a notable gap, underscoring the need to examine the role of phonological constraints in shaping the unmarked or frozen forms of Arabic binomials. In this study, *reversals* will be treated as an independent category alongside conformity and plateau, referring to instances where sound sonority values are inverted, thereby deviating from the expected principles. On the other hand, *plateaus* will be used to denote instances of equal sonority values, which similarly breach principles that anticipate either higher or lower sonority levels. This categorization enables a more precise evaluation of onset and coda sonority constraints in Arabic binomials, drawing on the methodology employed in [12] to analyze Arabic complex codas within the framework of the Sonority Sequencing Principle.

Despite substantial progress in configuring the principles governing word order in binomials, the universality of the proposed constraints has not been validated and remains a matter of contention. As binomials are claimed to be inherently orderable and hence must follow a particular sequence [13], linguists have proposed several controlling constraints that can be divided into categories depending on syntactic, semantic, phonological, pragmatic, or prosodic features [14, 15]. However, Cooper and Ross attributed conditioning in binomial word order solely to semantic and phonological factors. They posited seven phonological constraints, outlined in Section 2 below, and argued that while semantic constraints are not universal, phonological constraints are. A primary limitation of their study and generalization is the need for sufficient non-English data. Building on this work, Pinker and Birdsong [16] determined that the 'universality' of phonological constraints is limited to two specific rules: Panin's Law (fewer syllables in A conjunct than in B) and vowel quality (shorter vowels in A than in B). They noted that the sonority onset principle was adhered to only by native English speakers, underscoring the necessity for further research on word order in languages other than English. Research on Arabic phonology suggests that phonological conditioning is generally not a reliable predictor of binomial ordering in certain Arabic varieties, such as Jordanian and Iraqi Arabic [6, 17]. In a subsequent study conducted with a colleague [12], the Sonority Sequencing Principle was evaluated in the context of Modern Standard Arabic (MSA) complex codas. The findings, based on a corpus of 500 MSA lexical pairs, revealed a conformity rate of just 42%. These results cast doubt on the broader applicability of sonority principles to Arabic binomials, indicating that their relevance may be shaped by specific contextual factors rather than universal linguistic tendencies.

This uncertainty, coupled with the limited research on Arabic phonology in this domain, has prompted the present study to explore the applicability of two sonority constraints—onset sonority and coda sonority - in predicting binomial word order in Jordanian Arabic (JA), the author's Arabic variety. The study seeks to determine whether the results align with the universality claims of Cooper and Ross and some other scholars [10, 18, 19] or if they support Pinker and Birdsong's [16] restriction of universality to Panin's Law and vowel quality constraints. Specifically, this descriptive and quantitative investigation addresses the following two research questions:

(1) Onset Sonority (OS): Do frozen JA binomials conform to the OS principle, which posits that the initial sound of the first conjunct is more sonorous than the second? If so, what are the percentages of a) conformity, b) reversals, and c) plateaus?

(2) Coda Sonority (CS): Do frozen JA binomials conform to the CS principle, which asserts that the final sound

of the first conjunct is less sonorous than that of the second? If so, what are the percentages of a) conformity, b) reversals, and c) plateaus?

# 2. Background

## 2.1. Sonority Principles

Sonority principles categorize speech sounds according to their level of sonority, with vowels being the most sonorous, followed by glides, liquids, nasals, and obstruents. A fundamental sonority principle is the Sonority Sequencing Principle (SSP), which describes a pattern of increasing sonority from the onset to the nucleus and decreasing sonority from the nucleus to the coda. This principle has been assumed to organize syllable structure and phonotactic patterns across languages [20]. The onset sonority and the coda sonority principles are two more specific sonority principles. The OS principle concerns the relative sonority of sounds at the beginning of syllables, proposing that the initial sound generally exhibits greater sonority than subsequent sounds within the same syllable [21]. In contrast, the CS principle relates to the sonority of sounds at the end of syllables, suggesting that the final sound typically has less sonority than preceding sounds within the same syllable [22]. Cooper and Ross extended the application of the OS and CS principles to both conjuncts in their analysis of the linear order of English frozen binomials. According to their model, the OS principle posits that the initial sound of the first conjunct should be more sonorous than that of the second. In contrast, the CS principle proposes that the final sound of the first conjunct should be less sonorous than the final sound of the second. Sonority-based principles have been presented to determine the conventional ordering of binomials across languages [23, 24]. However, research suggests that the influence of these principles may vary depending on specific phonological patterns and cultural conventions across different languages [25–27]. Stress patterns, syllable weight, and morphological structure may interact with sonority constraints, influencing the ordering of binomials [28, 29].

## 2.2. Jordanian Arabic

Jordanian Arabic, a descendant of Modern Standard Arabic (MSA), manifests in three distinct regional variations: Rural Jordanian Arabic (RJA), which predominates in northern Jordan and extends to the main villages and suburbs of major cities [30], Bedouin Jordanian Arabic (BJA) spoken in specific areas across the northern, central, and southern regions, and Urban Jordanian Arabic (UJA), predominantly spoken in central urban locales [31]. As geographically distributed in **Figure 1**, these varieties broadly share a common phonological, lexical, and grammatical foundation, closely aligning with the consonantal inventory of Modern Standard Arabic (MSA), as shown in **Table 1** [32], with some modifications.


**Figure 1.** Map of the Hashemite Kingdom of Jordan.

**Table 1.** Modern Standard Arabic consonantal inventory.

| | Bilabial | Labiodental | Dental | Alveolar | Post-Alveolar | Palatal | Uvular | Velar | Pharyngeal | Glottal |
|---|---|---|---|---|---|---|---|---|---|---|
| **Plosive** | b | | | d dˤ<br>t tˤ | | | | q<br>k | | ʔ |
| **Nasal** | m | | | n | | | | | | |
| **Fricative** | | f | θ<br>ð ðˤ | z<br>s sˤ | | ʃ | x ʁ | | ħ ʕ | h |
| **Affricate** | | | | | dʒ | | | | | |
| **Glides** | w | | | | | j | | | | |
| **Flaps** | | | | r | | | | | | |
| **Laterals** | | | | l | | | | | | |

Although some phonetic differences exist among the three Jordanian Arabic varieties, they do not impede mutual intelligibility [30]. The Jordanian dataset used in the present study was phonemically transcribed for accuracy and consistency to reflect the specific characteristic features of rural Jordanian Arabic (RJA). This variant preserves MSA's plain and emphatic consonants. Notably, RJA speakers frequently realize the voiced emphatic alveolar /dˤ/ as a voiced emphatic interdental [ðˤ], the voiceless velar plosive /q/ as a voiced velar plosive [g] [33], and the voiceless velar plosive /k/ as a voiceless postalveolar affricate [tʃ] [34]. A lateral approximant [ɫ] that is either velarized (produced with the back of the tongue raised toward the velum) or pharyngealized (produced with a narrowing in the pharynx) typically occurs when /l/ is positioned near an emphatic sound [35].

In terms of vowels, RJA retains the MSA monophthongs, including the long vowels /ɑː/, /uː/, and /iː/, along with their short counterparts /a/, /u/, and /i/. However, RJA diverges from MSA by replacing the diphthongs /aj/ and /aw/ with the long mid vowels /eː/ and /oː/, respectively [36]. These, along with their short forms- /e/ and /o/- are considered integral components of the RJA vowel inventory [32, 37].

The syllabic structure of RJA aligns closely with the general patterns observed in Jordanian Arabic, encompassing both open and closed syllables [31]. Common syllable types include CVV and CV, as in /ma: ma/ (mum); CCV, as in /nħa.ra/ (burnt), CVC, as in / mal.ʕab/ (playground); CCVC, as in /btil-ʕab/ (play); CVVC, as in /ki:s/ (bag); CCVVC, as in /ṣħu:n/ (plates); CCVCC, as in /drobs/ (candy); and CVCC, as in /kalb/ (dog) [38]. Monosyllabic words are common, with disyllabic and trisyllabic words being the most frequent, while quadrisyllabic or longer words are rare [38].

Like the English syllable structure, the RJA syllable comprises a nucleus (an obligatory segment that may be short or long), an onset, and an optional coda. However, RJA typically restricts the coda to a single consonant, with additional consonants often resolved through the insertion of an epenthetic vowel [12, 39].

## 3. Literature Review

This section examines existing research on phonological constraints in binomials, focusing on the non-metrical principles - onset and coda sonority, whose relevance is the subject of the current investigation. Much of the research on irreversible binomials has sought to identify the factors that govern the fixed order of elements, with Cooper and Ross' study [1] making early and significant contributions. They identified notable phonological features, such as the tendency for the first element in a binomial to have more obstruent initial consonants and fewer final consonants, in addition to other factors like syllable count, vowel length, and stress placement. Claimed to be universal, these phonological features have become foundational for subsequent studies on the phonological structures of binomials across various languages.

Pinker and Birdsong [16] conducted tests on fabricated English binomials to evaluate the validity of Cooper and Ross's principles and their claims of universality. Their findings affirmed the relevance of most of these principles to English, including onset sonority. However, the results regarding coda sonority were less consistent and failed to support the coda sonority principle. These conclusions indicate that phonological constraints may not be universally applicable and can vary across different languages. This underscores the necessity of examining binomials within their specific linguistic contexts to understand how phonological constraints are fully implemented.

Renner [40] contributed further to the study of phonological constraints by employing statistical methods to rigorously analyze the ordering of English binomials. His findings reinforced that initial and final consonant obstruents play a significant role in determining binomial order. Similarly, research [10, 41] focused on metrical constraints, such as stress patterns and syllable length, over non-metrical phonological factors. These studies suggested that while phonological constraints remain important, metrical considerations often have a more decisive influence on binomial ordering, particularly in languages with complex stress systems like English.

Cross-linguistic studies have significantly broadened the investigation of binomial ordering beyond English, illustrating the influence of phonological constraints across various languages. Research on Persian, Turkish, and Kurdish binomials demonstrates that factors such as onset and coda sonority continue to shape ordering patterns. For instance, it has been found that in Persian binomials, syllable size, and vowel length influence the order of conjuncts, often outweighing the effects of sonority [42]. Similarly, the interplay between phonological constraints and language-specific features in Turkish determines binomial structures[2]. In Badini Kurdish, there seems to be a preference for shorter vowels in the first conjunct, which had a more significant impact than sonority, echoing patterns in English and other languages[43].

Despite the progress in understanding phonological constraints in various languages, research on Arabic binomials remains relatively limited. Saeed[17] undertook one of the few studies on this topic, examining the applicability of Cooper and Ross's principles to Iraqi Arabic. Saeed found that Iraqi Arabic diverges from English in its preference for less sonorous initial consonants in the first conjunct, revealing a reverse pattern of onset sonority. This contrasts sharply with English examples, such as "make or break," where the first conjunct contains a more sonorous onset. Moreover, Saeed's investigation into coda sonority highlighted potential misinterpretations, as several of his examples might conform to the coda sonority constraint when scrutinized more closely. This observation calls for a more nuanced understanding of phonological constraints in Arabic, particularly given the diverse dialectal variations across the Arabic-speaking world.

The limited research on the phonology of Arabic binomials underscores the need for further investigation, particularly on onset and coda sonority. A closer examination of these principles will clarify binomial ordering in Arabic. Moreover, the findings will determine whether Arabic binomials, as exemplified by Jordanian Arabic in this study, support the universality claims of Cooper and Ross[1] or align with Pinker and Birdsong's[16] argument that the phonological universality in this regard is restricted to Panin's Law and vowel quality, with limited relevance to onset and coda sonority.

# 4. Methodology

## 4.1. Data Collection

Stefanowitsch[44] presents a compelling case for drawing binomial samples from corpora and databases rather than relying on dictionaries or anecdotal lists. While no comparable corpora exist for Jordanian Arabic binomials, this study addresses this gap by carefully collecting naturally occurring data over the past two years from various social and cultural contexts. These sources include Jordanian television episodes and series, social media platforms, spontaneous everyday speech, newspapers, magazines, and commercial advertisements. Binomials were sourced from Jordanian television, social media, daily conversations, print media, and advertisements and analyzed in the rural Jordanian variety (RJA). The dataset primarily focuses on Northern Jordanian Arabic (NJA), prevalent in cities, villages, and suburban areas across the northern region, including Irbid, Ajloun, and Jerash, as demonstrated in **Figure 1**. Northern Jordanian Arabic is distinguished by its preservation of certain phonological features, such as the voiced velar plosive /g/, the replacement of diphthongs /aj/ and /aw/ with long mid vowels /eː/ and /oː/, and the velarized lateral approximant /ɫ/ in emphatic contexts. These features are prominent in the dataset and reflect the phonetic characteristics unique to this regional variety. The binomials collected were carefully curated to represent natural usage across rural and urban northern communities, ensuring consistency with authentic linguistic practices.

By adopting Stefanowitsch's[44] method of utilizing a large, authentic dataset, this study has compiled 400 Northern Jordanian Arabic binomials representing various lexical categories, including nouns, adjectives, verbs, adverbs, and conjunctions. Although the focus is on Northern Jordanian Arabic, the diversity of sources—from media to spontaneous conversation—ensures the robustness and authenticity of the dataset for analyzing phonological constraints. These syntactic categories represent all potential formations under 'nomi'[45]. Thus, the dataset mainly comprises conjoined pairs (e.g., /milħ (iw) **s**ukkar/, "salt and sugar"); oppositional (e.g., /saḥl iwa ṣaʕb/, " easy and difficult"); sequential (e.g., / gabl iw baʕd/, "before and after"); enumerative (e.g., /glaːm iw dafaːtɪr/ "pens and notebooks"); descriptive (e.g., /kabiːr iw waːsiʕ/, "big and wide"); causal (e.g., /sabab iw natiːdʒih/, "cause and effect"); modals (e.g., laʕalla wa ʕasa/, " may (it be) and might (it be)"); quantitative (e.g., /kθ iːr iw galiːl/, "many and few"); functional (e.g., /duktɔːr iw mʊhændɪs/, "doctor and engineer"); directional (e.g., /ʃaˈmɑːl iw dʒaˈnuːb/, " North and South"); and distal deixis (e.g., / g aˈriːb iw baˈʕiːd/, "near and far").

The dataset excludes binomials with identical case endings, such as those ending in the singular feminine marker ة (tāʔ marbūṭa), which is realized in Jordanian Arabic as a voiceless glottal fricative [h] (e.g., قاعدة وساكتة /gaːʕdih iw saːktih/, "sitting and silent"), as well as their plural forms ending with the sound feminine plural marker ات/a:t/. Furthermore, in line with the English pattern of "more and more" or "so and so," categorized as "echoic binomials"[18], all equivalent instances in the data, such as /heik iw heik/ and /keit iw keit/, were excluded. Such exclusions are crucial to ensuring the accurate investigation of the coda sonority principle. Our analysis focuses on binomials classified as 'theoretically reversible'[46], such as /leil wi nhaːr/ ("day and night") and /xeir iw ʃar / ("good and evil"). These pairs follow the irreversible structure seen in expressions like 'pros and cons' or 'cats and dogs,' where Y could theoretically precede X, but in practice, this order is rarely reversed. In other words, reversible binomials like 'radio and television' or 'television and radio'[47] fall outside the scope of this study and have therefore been excluded from the analysis.

Saeed[17] suggests that minimal pairs are ideal for testing phonological principles. However, this approach is often impractical, as binomials do not typically provide this environment. In this study, most binomials do not fit the minimal pair criteria or are only loosely related. Therefore, our analysis includes binomials beyond the minimal pair paradigm, recognizing that phonological principles can be tested without relying exclusively on minimal pairs.

To validate the frozen and non-reversible nature of the selected binomials, a panel of native Jordanian Arabic speakers, including three senior linguists with extensive language expertise, evaluated their fixedness. Each binomial was presented in canonical and reversed forms within carefully crafted contextual sentences. The panel assessed the natural order of the conjuncts, with a consensus deeming the reversed forms as unnatural or unacceptable, thereby substantiating the fixed nature of the selected binomials. This method, grounded in the linguistic expertise and intuitive judgment of native speakers, provided robust and reliable validation of the claim that the selected binomials are non-reversible.

## 4.2. Data Analysis

The 400 binomials were collected and categorized as outlined in Section 4.1, transcribed phonemically, and subsequently analyzed for onset and coda sonority principles defined in Section 2.1 above. Their respective sonority values were assigned based on Hogg and McCully's Sonority Scale[48], as illustrated in **Table 2** below.

**Table 2.** Hogg and McCully's Sonority Scale.

| Sound | Sonority Value |
|---|---|
| Low vowels | 10 |
| Mid Vowels | 9 |
| High Vowels | 8 |
| Flaps | 7 |
| Laterals | 6 |
| Nasals | 5 |
| Voiced fricatives | 4 |
| Voiceless fricatives | 3 |
| Voiced stops | 2 |
| Voiceless stops | 1 |

Sonority, a phonological property primarily defined by intensity, degree of airflow obstruction, and voicing[49, 50], is effectively modeled using scales incorporating intensity measurements. Among the various sonority scales proposed[22, 48, 51, 52], Hogg and McCully's scale, presented in **Table 2** below, is widely recognized for its accuracy in categorizing obstruents into fricatives and stops, with further distinctions based on voicing[12]. This scale holds particular significance for the present study due to its alignment with the theoretical framework proposed by Cooper and Ross[1], which serves as a key reference. Its comprehensive classification system underpins the study's descriptive methodology and directly informs the formulation of its research questions, ensuring a rigorous analytical foundation.

Affricates were classified as stop consonants based on the sonority scale adopted for this study. Coarticulation effects were excluded for two primary reasons: first, the analysis focuses on frozen, formulaic binomials analogous to dictionary lexical entries; second, our sonority scale does not account for coarticulation phenomena. Consequently, the analysis prioritizes the phonemic representation of onset and coda consonants over their phonetic variations. Additionally, given that most Arabic binomials begin with the definite article /al/ 'the' this article was systematically omitted from the data to pinpoint the actual onset of each conjunct. Throughout the study, binomials are presented in their phonemic transcriptions alongside their English translations.

The sonority status of a binomial's onset and coda was classified into three distinct categories: conformity, reversals, and plateaus. These categories represent the patterns observed when applying onset and coda sonority principles. *Conformity* indicates adherence to these principles, where the sonority values align with the expected hierarchy. *Reversals* refer to deviations in which the sonority value assigned to onsets or codas, based on the scale, is inverted—either higher or lower than anticipated. *Plateaus* are characterized by equal sonority values, constituting deviations from the expected principles. Therefore, reversals and plateaus violate the sonority principles under investigation.

In the statistical analysis, we used several methods: the Goodness-of-Fit Test (Chi-Square Test) to assess whether the proportions of conformity, reversals, and plateaus adhered to equal distribution, Likelihood Ratio Tests to evaluate the strength of evidence for hypotheses regarding proportions, Pairwise Comparisons to examine differences between specific pairs of categories (conformity vs. reversals, conformity vs. plateaus, reversals vs. plateaus), and the conformity violation test to determine if the combined counts of reversals and plateaus statistically outnumbered conformity.

# 5. Results and Discussion

## 5.1. Onset Sonority

The statistical analysis of the 400 JA binomials examined indicates that only 159 binomials (39.75%) conform to the onset sonority principle. Conversely, 241 binomials (60.25%) demonstrate deviation from this principle. These deviations can be classified into two categories: 'reversals,' comprising 154 cases (38.50%), and 'plateaus,' comprising 87 cases (21.75%), as individually demonstrated in **Figure 2** and collectively in **Figure 3**.

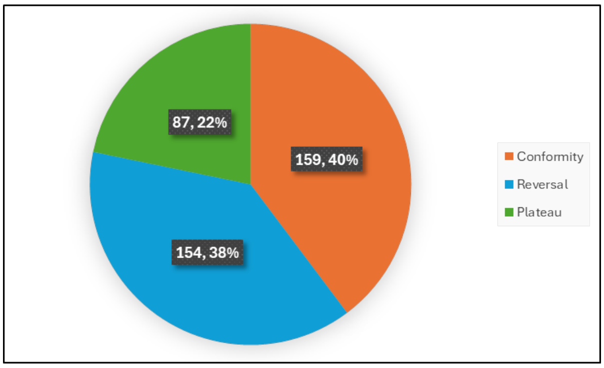


**Figure 2.** Onset Sonority Status of JA binomials.

The statistical analysis reveals a significant deviation from the anticipated conformity, challenging the onset sonority principle as a reliable predictor in RJA. This finding contrasts with Cooper and Ross's[1] claim that the onset sonority principle applies universally. According to Cooper and Ross, the initial sound in the first conjunct should exhibit higher sonority than the second; however, this pattern was not observed in 60.25% of the binomials studied. Specifically, 38.50% of the binomials demonstrated reversals, where the sonority hierarchy was inverted, and 21.75% exhibited plateaus, where the sonority of the initial sounds was equal.

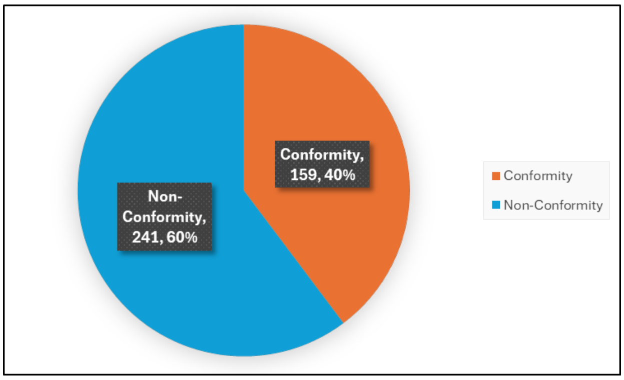


**Figure 3.** Contrast between conformity and non-conformity in onset sonority.

In direct comparison with Pinker and Birdsong's findings[16], our results support their argument that phonological universality may be limited to specific rules, such as Panin's Law or vowel quality constraints. Pinker and Birdsong's assertion that the onset sonority principle was adhered to primarily by native English speakers aligns with the evidence from our study, where Jordanian Arabic binomials significantly deviated from this principle. This divergence highlights how cultural and linguistic contexts influence the applicability of phonological constraints, suggesting that the onset sonority principle may be more language-specific than previously thought.

Moreover, our findings contribute a novel perspective by quantifying non-conformity through the distinct categories of reversals and plateaus. While Cooper and Ross focused predominantly on conformity within English binomials, this study's categorization of non-conformity offers a more nuanced understanding of how these principles manifest—or fail to manifest—in Jordanian Arabic. By examining non-conforming instances in detail, our results expand upon Pinker and Birdsong's assertion that universal principles are not equally relevant across all languages, emphasizing the role of phonological and sociolinguistic variability.

### 5.1.1. Conformity to Onset Sonority

As shown in **Figure 2**, adherence to the onset sonority principle was observed in only 159 out of 400 instances (39.75%). The examples in **Table 3** below illustrate this occurrence.

According to Hogg and McCully's sonority scale, the first consonant in each example exhibits higher sonority than the first consonant in the subsequent conjunct. For instance, in example 1, the sonority of the nasal /m/ surpasses that of the voiceless fricative /s/. Similarly, in example 2, the sonority of the voiced fricative /ɣ/ exceeds that of the voiceless fricative /f/. Moreover, in example 3, the sonority of the voiceless fricative /sˤ/ is greater than that of the voiced stop /b/, and so forth.

### 5.1.2. Non-Conformity to Onset Sonority

As demonstrated in **Figure 2** above, non-conformity was observed in 241 instances (60.25%), categorized into reversals (154; 38.50%) and plateaus (87; 21.75%), as exemplified in **Tables 4** and **5**, respectively.

**Table 3.** Examples of conformity to onset sonority in Jordanian Arabic Binomials.

| No. | JA | Phonemic Transcription | English | Onset Sonority |
|---|---|---|---|---|
| 1 | ملح وسكر | /**m**ilħ (iw) **s**ukkar/ | salt and sugar | nasal > voiceless fricative |
| 2 | غني وفقير | /**ɣ**ani: (iw) **f**agi:r/ | rich and poor | voiced fricative > voiceless fricative |
| 3 | صفار وبياض | /**sˤ**afa:r (iw) **b**aja:ðˤ/ | yolk and albumen | voiceless fricative > voiced stop |
| 4 | نخوه وشهامه | /**n**axwah iw **ʃ**aha:mih/ | valor and noble-mindedness | nasal > voiceless fricative |
| 5 | راضي وزعلان | /**r**a:ðˤi: iw **z**aʕla:n/ | content and upset | flap > voiced fricative |
| 6 | عمى وطراش | /**ʕ**ama: wi **tˤ**ra:ʃ/ | blindness and deafness | voiced fricative > voiced stop |
| 7 | مطوى وفراش | /**m**itˤwa: wi **f**ra:ʃ/ | Bed-base and bedding | nasal > voiceless fricative |
| 8 | حماه وكنه | /**ħ**ama:h iw **k**annih/ | mother-in-law and daughter-in-law | voiceless fricative > voiceless stop |
| 9 | رز ولبن | /**r**uzz (iw) **l**aban/ | rice and yogurt | flap > lateral |
| 10 | فوقاني وتحتاني | / **f**ɔ:ga:ni iw **t**iħta:ni/ | above and below | voiceless fricative > voiceless stop |

**Table 4.** Examples of reversals to onset sonority in Jordanian Arabic binomials.

| No. | JA | Phonemic Transcription | English | Onset Sonority |
|---|---|---|---|---|
| 11 | عيش وملح | /**ʕ**ei:ʃ iw **m**iliħ/ | bread and salt | voiced fricative < nasal |
| 12 | طول وعرض | /**tˤ**u:l (iw) **ʕ**arðˤ/ | length and width | voiced stop < voiced fricative |
| 13 | قط وفار | /**g**utˤ iw **f**a:r/ | cat and mouse | voiced stop < voiceless fricative |
| 14 | قميص وربطه | /**g**ami:sˤ (iw) **r**abtˤah/ | shirt and tie | voiceless stop < flap |
| 15 | كف ومخرز | / **k**aff iw **m**ixraz/ | a hand and an awl | voiceless stop < nasal |
| 16 | بال وخاطر | /**b**a:l iw **x**a:tˤir / | mind and heart | voiced stop < voiceless fricative |
| 17 | كرم وجود | /**k**aram iw **dʒ**u:d/ | generosity and magnanimity | voiceless stop < voiced stop |
| 18 | شحم ولحم | /**ʃ**aħm (iw) **l**aħm/ | fat and flesh | voiceless fricative < lateral |
| 19 | ساهي لاهي | /**s**a:hi: **l**a:hi:/ | heedless and distracted | voiceless fricative < lateral |
| 20 | هم وغم | /**h**amm (iw) **ɣ**amm/ | worry and sorrow | voiceless fricative < voiced fricative |

**Table 5.** Examples of onset sonority plateaus in Jordanian Arabic binomials.

| Number | JA | Phonemic Transcription | English | Onset Sonority |
|---|---|---|---|---|
| 21 | حامض حلو | /**ħ**a:miðˤ **ħ**ilw/ | sweet and sour | both voiceless fricatives |
| 22 | حلال وحرام | /**ħ**ala:l (iw) **ħ**ara:m/ | lawful and unlawful | both voiceless fricatives |
| 23 | خامر وعويص | /**x**a:mir (iw) **ʕ**awi:sˤ/ | the fermented and the unfermented | both voiced fricatives |
| 24 | أسمر وأبيض | /**ʔ**asmar (iw) **ʔ**abjaðˤ/ | black and white | both glottal stops |
| 25 | بعيد وقريب | /**b**aʕi:d (iw) **g**ari:b/ | far and near | both voiced stops |
| 26 | خل وخردل | /**x**all (iw) **x**ardal/ | vinegar and mustard | both voiceless fricatives |
| 27 | بيض وبطاطا | /**b**eiðˤ (iw) **b**atˤa:tˤa:/ | eggs and potatoes | both voiced stops |
| 28 | عصفور وخيط | /**ʕ**asˤfu:r (iw) **x**eitˤ/ | A bird and a thread | both voiced fricatives |
| 29 | عم وخال | /**ʕ**amm (iw) **x**a:l/ | paternal uncle and maternal uncle | both voiced fricatives |
| 30 | ماكول مذموم | /**m**a:ku:l **m**aðmu:m/ | eaten and disparaged | both nasals |

In all instances from 11 to 20, the sonority of the initial consonant in the first conjunct of the binomials is lower than that of the initial consonant in the second conjunct. These cases are, therefore, classified as Reversals, representing a primary form of non-conformity.

In examples 21 through 30, the initial consonant of the first conjunct exhibits equal sonority compared to the initial consonant in the second conjunct. This observation indicates a breach of the sonority onset principle. Consequently, these instances are classified as a distinct type of non-conformity. While reversals represent a significant deviation from the expected pattern, sonority plateaus, though considered "less problematic" than reversals [53], still constitute a logical contradiction to the principle under examination.

A hypothesis test was conducted to determine if the proportions of the three categories—conformity, reversals, and plateaus—align with the distribution (1/3, 1/3, 1/3), suggesting equal proportions and attributing any differences observed solely to chance. The findings of this goodness-of-fit test are detailed in **Table 6**.

**Table 6.** Goodness-of-fit test for the onset sonority results.

| | Observed Frequencies $O_i$ | Expected Frequencies $E_i$ | Exact Significance |
|---|---|---|---|
| **Conformity** | 159 | 133.33 | $5.436 \times 10^{-6}$ |
| **Reversals** | 154 | 133.33 | |
| **Plateaus** | 87 | 133.33 | |
| **Total** | 400 | 400 | |

The test statistic for the hypothesis test $H_0$: "The proportions are $p_1 = p_2 = p_3 = \frac{1}{3}$" against $H_1$: "The proportions are not $p_1 = p_2 = p_3 = \frac{1}{3}$" is $\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$, where $O_i$ are the observed counts and $E_i$ are the expected counts. The calculations yield the test statistic $\chi^2 = 24.24$, and the p-value associated with the test statistic is *p-value*$=$ $5.436 \times 10^{-6}$ . Therefore, we reject the null hypothesis and conclude that the proportions are unequal. The p-value signifies that the differences in proportions are statistically significant and not attributable to chance. The data provide compelling evidence that the proportions of Conformity, Reversals, and Plateaus differ significantly. The observed frequencies (159, 154, and 87) are highly unlikely to result from random variation, indicating that the differences are significant and meaningful. In other words, the distribution of the JA binomials into the three categories—conformity, reversals, or plateaus—is not random.

Given the extremely small p-value, we reject the null hypothesis and conclude that the proportions are unequal. This low p-value indicates that the differences in proportions are statistically significant and unlikely to be due to chance. Consequently, the data provide strong evidence that the proportions of conformity, reversal, and plateaus differ significantly. The observed frequencies (159, 154, and 87) are highly improbable to result from random variation, confirming that the differences are statistically significant and meaningful. Thus, the Jordanian Arabic (JA) binomial distribution across these categories—Conformity, Reversal, and Plateaus—is not random.

To quantitively understand the relationship between the different categories, statistical analyses were performed using the Java module in Jamovi [54]. Likelihood ratio tests were preferred to chi-squared tests as we were interested in proportions rather than variance [55, 56] and were calculated as usual, providing a G and p-value [57]. In addition, log-likelihood ratio tests provided the support (S) representing the strength of evidence for one hypothesis versus another. If there were no evidence either way, S would be close to 0 and depart from 0 in the range - ∞ to + ∞ -, indicating the strength of support for the first hypothesis versus the second, according to the polarity [58]. Occam's bonus correction was applied to S [59], as demonstrated in **Table 7**.

**Table 7.** Evidence strength with Occam's bonus correction.

| Score (S) | Likelihood Ratio (LR) | Evidence for H1 vs. H2 |
|---|---|---|
| 0 | 1 | No evidence either way |
| 1 | 2.7 | Weak evidence |
| 2 | 7.4 | Moderate evidence |
| 3 | 20.1 | Strong evidence |
| 4 | 54.6 | Extremely strong evidence |
| 7 | 1096.6 | More than a thousand to one |
| 14 | 1.2 × 10ˆ6 | More than a million to one |

Thus, for the null hypothesis assuming equal distribution across the three categories, there was a statistical departure from the expected values, $G(2) = 26.08$, $p < 0.0001$. There was exceedingly strong evidence against the null, $S = 12.0$.

We can then make three pairwise comparisons: conformity vs. reversal (C v R), conformity vs. plateau (C v P), and reversal vs. plateau (R v P). For C v R, there was no statistical difference, G (1) = 0.08, p = 0.777, and less than weak evidence, S = 0.46, in favor of the null hypothesis. For C v P, C was statistically greater than P, G (1) = 21.38, p < 0.0001, and exceedingly strong evidence against the null, S = 10.2. While for R v P, R was statistically greater than P, G (1) = 18.87, p < 0.0001, with exceedingly strong evidence against the null, S = 8.9. To check for a conformity violation, we combine the counts of reversal and plateau and test against conformity. This shows that conformity is statistically outnumbered by non-conformity, G (1) = 16.93, p < 0.0001, with exceedingly strong evidence against the null, S = 8.0.

The analysis reveals a clear imbalance, with non-conformity significantly outweighing conformity (G (1) = 16.93, p < 0.0001, S = 8.0), indicating strong evidence against the expected equal distribution. This indicates that the onset sonority principle cannot reliably predict the ordering of JA binomials. The high rate of non-conformity challenges the validity of the principle, which is effective for some European languages, as noted in Section 3.

The statistical analysis indicates a notable deviation from the anticipated conformity, thus challenging the notion of the onset sonority principle as a reliable predictor in JA and supporting the view that such phonological constraints may vary significantly across languages. As stated above, this finding contradicts the universality proposed by Cooper and Ross[1], who advocate for the broad applicability of the onset sonority principle. The high proportion of non-conforming instances, particularly the substantial percentages of reversals (38.50%) and plateaus (21.75%), suggests that the principle may not be as universally applicable as previously claimed. In contrast, the results align with Pinker and Birdsong's[16] perspective that phonological constraints might be limited in scope and not universally applicable. Additionally, the observed plateaus corroborate Carlisle's[53] view, which regards them as less problematic than reversals yet still indicative of a breach in principle. Moreover, the significant non-conformity, encompassing reversals and plateaus, supports Saeed's[17] argument that phonological constraints are subject to contextual and language-specific variations rather than universally applicable.

These findings underscore the need for a more nuanced understanding of phonological constraints across different languages. For instance, a contrastive study on English and French binomials[60] illustrates this point vividly, though using different constraints: English speakers prefer Simple Rhyme for disyllabic binomials and Ablaut for monosyllabic ones, while French speakers consistently favor Ablaut regardless of syllable count. This indicates that preferences in binomial expressions are language-specific, illustrating the distinction between language universals and particular linguistic tendencies. It is unsurprising that Jordanian Arabic binomials significantly deviate from the onset sonority principle that applies to English, especially considering the distinctly different language families each belongs to.

## 5.2. Coda Sonority

A similar analysis of coda sonority shows that among the 400 JA binomials examined, 131 instances (32.67%) adhere to the coda sonority principle, leaving 269 (67.33%) that diverge from this principle. These deviations manifest as reversals in 112 (27.93%) cases and plateaus in 157 (39.40%) instances, as demonstrated individually in **Figure 4** and collectively in **Figure 5**.

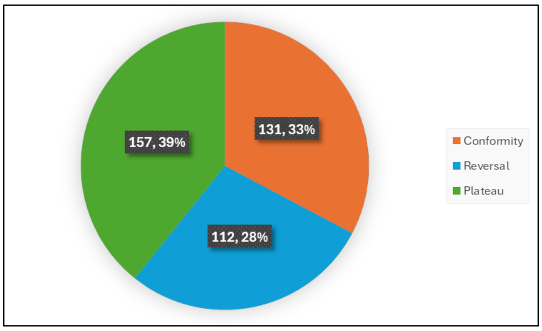


**Figure 4.** Coda sonority status of JA binomials.

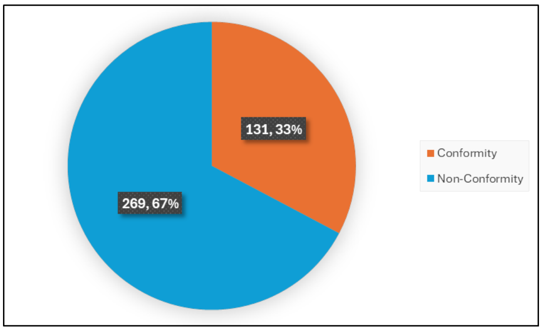


**Figure 5.** Contrast between conformity and non-conformity in coda sonority.

The analysis of coda sonority in JA binomials indicates substantial deviations from the coda sonority principle outlined by Cooper and Ross[1]. Specifically, only 32.67% of the binomials conformed to the principle, while 67.33% deviated, showing reversals in 27.93% of cases and plateaus in 39.40%. These deviations challenge Cooper and Ross's assumption of universality, as the principle posits that the final sound of the first conjunct should have a lower sonority than the final sound of the second.

Our findings further support Pinker and Birdsong's[16] critique of phonological universality. Pinker and Birdsong observed that coda sonority patterns were inconsistent even within English binomials, casting doubt on the principle's broader applicability. Our results echo these inconsistencies, revealing that coda sonority constraints do not reliably predict binomial ordering in Jordanian Arabic. This finding underscores the need to reevaluate the scope of these principles, especially when applied to non-Indo-European languages.

In addition, while Cooper and Ross emphasized the role of phonological constraints in binomial ordering, our study highlights the importance of considering language-specific phonetic and cultural factors. For instance, the prevalence of plateaus in coda sonority suggests a tolerance for equal sonority values that contradicts the hierarchical assumptions inherent in the principle. This observation aligns with findings in Iraqi Arabic[17], illustrating how Arabic varieties challenge the universal applicability of sonority-based constraints.

### 5.2.1. Conformity to Coda Sonority

As shown in **Figure 4**, adherence to the coda sonority principle was observed in only 131 out of 400 instances (32.67%), as exemplified in **Table 8** below:

**Table 8.** Examples of conformity to coda sonority in Jordanian Arabic binomials.

| No. | JA | Phonemic Transcription | English | Coda Sonority |
|---|---|---|---|---|
| 31 | خايس وماخوذ | /xaːji**s** **(iw)** maːxuː**ð**/ | 'Thingamajig and whatchamacallit' | voiced fricative > voiceless fricative |
| 32 | حيطه وحذر | /ħi:tˤa**h** (iw) ħaða**r**/ | caution and vigilance | flap > voiceless fricative |
| 33 | غث وسمين | / ɣa**θθ** (iw) samiː**n**/ | the wheat and the chaff | nasal > voiceless fricative |
| 34 | بر وتقوى | /bi**rr** (iw) taqw**a:**/ | filial piety and righteousness | vowel > flap |
| 35 | غاد وجاي | /ɣaː**d** (w) dʒaː**j**/ | coming and going | semi-vowel > voiced stop |
| 36 | شماغ وعقال | / ʃmaː**ɣ** (wi) ʕgaː**l**/ | keffiyeh and agal | Lateral > voiced fricative |
| 37 | شمس ونجوم | /ʃam**s** (wi) ndʒuː**m/** | sun and stars | nasal > voiceless fricative |
| 38 | كرشات وروس | /karʃa:**t** (w) ru:**s**/ | Tripes and heads | voiceless fricative > voiceless stop |
| 39 | شحم ونار | /ʃaħ**m** (iw) na:**r**/ | Fat and flame | flap > nasal |
| 40 | قرضه ودين | /girðˤa**h** (iw) dei**n**/ | Loan and debt | nasal > voiceless fricative |

In all these examples, the final consonant of the second conjunct exhibits higher sonority than that of the first conjunct, per Cooper and Ross's coda sonority principle. However, non-conformity predominates, as detailed below.

### 5.2.2. Non-Conformity to Coda Sonority

As shown in **Figure 4**, non-conformity was observed in 269 instances (67.33%), categorized into reversals (112; 27.93%) and plateaus (157; 39.40%), as exemplified in **Table 9** and **10**, respectively.

In all cases from 40 to 50, the final consonant in the second conjunct exhibits lower sonority than the final consonant in the first conjunct, thereby contradicting the expectations set forth by the coda sonority principle. Consequently, these cases and similar instances in the dataset are classified as reversals, representing a primary form of non-conformity to the coda sonority principle.

In examples 51 through 60, the sonority values of the final consonants in the first and second conjuncts are identical, as demonstrated in examples 51 to 58, or similar in examples 59 and 60. This pattern represents a violation of the coda sonority principle, which stipulates that the final consonant of the second conjunct should have a higher sonority than that of the first conjunct. These plateaus breach this principle, though to a lesser extent than reversals.

Statistically, the goodness-of-fit test can again be used to check whether the proportions of the three types- conformity, reversals, and plateaus- fit the distribution (1/3, 1/3, 1/3) in the coda sonority dataset, as shown in **Table 11** below.

**Table 9.** Examples of reversals to coda sonority in Jordanian Arabic binomials.

| No. | JA | Phonemic Transcription | English | Coda Sonority |
|---|---|---|---|---|
| 41 | عين وحاجب | /ʕei**n** (iw) ħa:dʒi**b**/ | eye and eyebrow | voiced stop < nasal |
| 42 | يمن وبركات | /jum**n** (iw) baraka:**t**/ | prosperity and blessings | voiceless stop < nasal |
| 43 | أخضر ويابس | /ʔaxðˤa**r** (iw) ja:bi**s**/ | green and dry | voiceless fricative < flap |
| 44 | شعير وكرسنه | /ʃaʕi:**r** (iw) karsanni**h**/ | barely and fodder | voiceless fricative < flap |
| 45 | كوسى وبندوره | /ku:s**a**: (iw) bandɔ:ra**h**/ | zucchini and tomato | voiceless fricative < vowel |
| 46 | غالي ورخيص | /ɣa:l**i**: (iw) raxi:**sˤ**/ | expensive and cheap | voiceless fricative < vowel |
| 47 | فاضي مشغول | /fa:ðˤ**i:** maʃɣu:**l**/ | free and occupied | lateral < vowel |
| 48 | حاضر غايب | /ħa:ðˤi**r** ɣa:ji**b**/ | present and absent | voiced stop < flap |
| 49 | صبر وتين | / sˤabi**r**/ (iw) ti:**n** / | figs and prickly pear | nasal < flap |
| 50 | فقر وعنطزه | /fag**r** (iw) ʕantˤazi**h**/ | poverty and arrogance | voiceless fricative < flap |

**Table 10.** Examples of coda sonority plateaus in Jordanian Arabic binomials.

| No. | JA | Phonemic Transcription | English | Coda Sonority |
|---|---|---|---|---|
| 51 | بدري و وخري | / badr**i**: (iw) waxr**i**:/ | the early and the late | both end in high front vowels. |
| 52 | ألبان وأجبان | /ʔlba:**n** w ʔadʒba:**n**/ | milk and cheese | both end in the same nasal |
| 53 | تين وزيتون | /(it) ti:**n** (iw) zei:tu:**n**/ | figs and olives | both end in the same nasal |
| 54 | حيله وفتيله | /ħi:li**h** (iw) fati:li**h** / | my lifeline and anchor | both end in the same voiceless fricative |
| 55 | صم وبكم | /sˤum**m** (iw) buku**m**/ | the deaf and non-verbal | both end in the same nasal |
| 56 | فرس وفارس | / fara**s** (iw) fa:ri**s**/ | horse and knight | both end in the same voiceless fricative |
| 57 | غمز ولمز | /ɣam**z** (iw) lam**z**/ | a nod and a wink | both end in the same voiced fricative |
| 58 | خص نص | /xa**sˤsˤ** na**sˤsˤ**/ | custom-fit | Both end in the same voiceless fricative |
| 59 | شرق وغرب | /ʃar**g** (iw) ɣar**b**/ | East and West | both end in voiced stops |
| 60 | زلم ونسوان | /zul**m** (iw) niswa:**n**/ | men and women | both end in the nasals. |

**Table 11.** Goodness-of-fit test for the coda sonority results.

| | Observed Frequencies $O_i$ | Expected Frequencies $E_i$ | Exact Significance |
|---|---|---|---|
| **Conformity** | 131 | 133.33 | 0.01836 |
| **Reversals** | 112 | 133.33 | |
| **Plateaux** | 158 | 133.33 | |
| **Total** | 400 | 400 | |

The test statistic $\chi^2 = 7.995$, and the p-value associated with the test statistic is 0.01836. Therefore, we reject the null hypothesis and conclude that the sample proves the proportions are unequal. We used the statistical analysis introduced in section 5.1.2.3 above to quantitatively understand the relationship between the different categories. For the null hypothesis assuming equal distribution across the three categories, there was a statistical departure from the expected values, G (2) = 7.62, p = 0.022. There was moderate evidence against the null, S = 2.8. As above, we can then make three pairwise comparisons. For C v R, there was no statistical difference, G (1) = 1.49, p = 0.223, and less than weak evidence, S = 0.2, against the null hypothesis. For C v P, C was not statistically less than P, G (1) = 2.53, p = 0.112, and less than weak evidence against the null, S = 0.8. Meanwhile, for R v P, P was statistically more significant than R, G (1) = 7.88, p = 0.005, with solid evidence against the null, S = 3.4. Combining the counts of reversal and plateau, we test against conformity. This shows that conformity is statistically outnumbered by non-conformity, G (1) = 48.6, p < 0.0001, with exceedingly strong evidence against the null, S = 23.8.

The analysis of coda sonority in JA binomials reveals a substantial deviation from the coda sonority principle proposed by Cooper and Ross. Among the 400 binomials examined, only 32.67% conform to this principle, where the final consonant of the second conjunct exhibits greater sonority than that of the first. This partial adherence highlights significant non-conformity: 67.33% of the binomials deviate from the principle, with 27.93% demonstrating reversals and

39.40% displaying plateaus. These findings suggest a more complex relationship between sonority and binomial ordering in Jordanian Arabic than anticipated by the principle.

Comparing these results with the work of Pinker and Birdsong[16], who contend that the universality of phonological constraints is limited, aligns with our findings. Non-conformity prevalence supports their view that the coda sonority principle may not be universally applicable. Additionally, Saeed's research, which emphasizes the variability of phonological constraints across languages, provides further context for our results. The statistical analysis ($\chi^2$ = 7.995, p = 0.01836) underscores the variability and complexity in phonological constraints, affirming Saeed's[17] perspective that these principles exhibit significant linguistic variability. This comparison contributes to the broader discourse on the scope and limitations of phonological constraints, particularly in Arabic binomials.

## 6. Conclusions

The investigation into the onset sonority principle revealed significant non-conformity in Jordanian Arabic (JA) binomials, with 60.25% failing to adhere to the principle. This non-conformity can be divided into two main categories: reversals (38.50%) and plateaus (21.75%). Statistical analyses, including chi-squared and likelihood ratio tests, revealed a significant imbalance in the distribution of conformity, reversals, and plateaus, further challenging the universality of the onset sonority principle. These findings echo Pinker and Birdsong's argument for language-specific variations in phonological constraints and contrast with Cooper and Ross's assertion of broader applicability. This suggests that onset sonority is more contextually dependent than universally applicable.

Similar non-conformity patterns were observed with the coda sonority principle, with 67.33% of JA binomials deviating from the expected order. Deviations include reversals (27.93%) and plateaus (39.40%), with only 32.67% conforming to the principle. Statistical tests revealed a significant disparity between conformity and non-conformity, reinforcing the limited applicability of the coda sonority principle. Like onset sonority, coda sonority does not reliably predict the ordering of JA binomials, further supporting the argument for language-specific variability in phonological constraints.

Both onset and coda sonority principles exhibit limitations in their universal applicability, though they differ in their patterns of non-conformity. Onset sonority shows a higher conformity rate (39.75%) than coda sonority (32.67%), with onset sonority experiencing more reversals and coda sonority showing more plateaus. These distinctions underscore that while both principles face challenges regarding universal applicability, the nature of their deviation and adherence varies.

This study provides compelling evidence of significant deviations in the adherence of Jordanian Arabic (JA) binomials to the onset and coda sonority principles, with most pairs exhibiting non-conformity. Specifically, 60.25% of binomials deviated from the onset sonority principle, while 67.33% violated the coda sonority principle. These results challenge the universality of phonological constraints, such as those proposed by Cooper and Ross[1], aligning more closely with the perspective of Pinker and Birdsong[16], which advocates for language-specific variability. This finding suggests that phonological principles may be influenced by contextual and cultural factors rather than being universally applicable.

The observed deviations in JA binomials are likely influenced by sociocultural and contextual factors specific to Arabic-speaking communities. In particular, Arabic traditions emphasize rhetorical balance and parallelism, which may override phonological expectations. Furthermore, the oral traditions and the prominence of semantic and pragmatic considerations in daily language use might shape the ordering of binomials. These sociolinguistic dynamics highlight the importance of contextual variability and point to the potential role of culture in modulating the universality of phonological principles.

This research makes a dual contribution to the field. First, it calls for reassessing the universality of phonological theories, especially when applied to non-Indo-European languages like Arabic. Second, it addresses a gap in the study of Arabic binomials, revealing that linguistic patterns in Jordanian Arabic diverge significantly from those found in English and other studied languages. While these findings are particular to Jordanian Arabic, they have broader implications for linguistic theory, especially regarding the tension between universal phonological principles and language-specific patterns. The deviations observed in JA binomials stress the need for incorporating cross-linguistic data into phonological research to develop more inclusive, universally applicable theories.

Moreover, this study emphasizes the importance of considering sociolinguistic and cultural factors in phonological research, as they can contribute significantly to the variability observed in language-specific patterns. Future research could expand on these findings by examining additional Arabic varieties or exploring other phonological constraints, such as vowel length and backness, stress patterns, phonotactic simplicity, alliteration, and assonance. By doing so, the field will move closer to understanding the complex interplay between universal phonological trends and the unique characteristics of individual languages, ultimately bridging gaps in our understanding of phonological and linguistic diversity.

In conclusion, the study demonstrates that both onset and coda sonority principles face significant limitations in their applicability to JA binomials, suggesting that these principles may be more context-specific than universally applicable. This highlights the need for further research into the nuanced application of phonological constraints across different languages and the importance of considering sociolinguistic and cultural factors when studying phonological patterns.

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## Institutional Review Board Statement

Ethical review and approval were not applicable to this study, as it did not involve human participants or animal subjects.

## Informed Consent Statement

Not applicable. This study did not involve human participants directly, as the data were obtained from publicly available sources, including social media, newspapers, and other media outlet.

## Data Availability Statement

Data is accessible to the public, and no restrictions apply.

## Conflicts of Interest

The author declares that there is no conflict of interest.

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