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Syllable Structure as a Theoretical Construct: New Insights into Onset–Rime and Moraic Models

Sania Habib
Bachelor in English Language and Literature, Gomal University, Dera Ismail Khan
Email: habibsania858@gmail.com

Babar Riaz
Visiting Lecturer, PhD Scholar, Department of English, University of Gujrat, Pakistan
Email: briaz064@gmail.com

Dr. Mustafa Ali Al-Hamzi
Assistant Professor, Department of English, Hajjah University, Yemen
Email: alhamzimustafa@hau.edu.ye

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Abstract

This study examines English syllable structure by critically comparing the onset–rime model and the moraic model, with a focus on their capacity to account for weight-sensitive phenomena such as stress assignment, syllable timing, and rhythmic patterns. The research utilises a systematically compiled dataset of English words, which were analysed for their onset, nucleus, coda, and moraic structure. Each syllable was evaluated under both models to determine how accurately they represent light, heavy, and superheavy syllables and to assess their predictive power for stress placement and prosodic behaviour. The findings indicate that the onset–rime model provides a clear and intuitive framework for structural segmentation, effectively describing phonotactic constraints, particularly in terms of permissible onset clusters and rime combinations. However, its binary treatment of weight limits its ability to capture the graded distinctions observed in English, especially in derivational and polysyllabic forms. The moraic model demonstrates greater precision in representing syllable weight by accounting for contributions of long vowels, diphthongs, and coda consonants, thereby offering a more reliable explanation for stress patterns, weight-sensitive behaviour, and rhythmic organisation. Overall, the study concludes that a complementary approach, which employs onset–rime structures for structural segmentation and moraic representations for prosodic analysis, provides the most comprehensive account of English syllable behaviour and highlights the nuanced interaction between segmental structure and prosody in the language.

Keywords: Syllable Structure, Onset–Rime Model, Moraic Model, English Phonology, Syllable Weight

Introduction

Syllable structure sits at the intersection of phonology, phonetics, and prosody, and it plays a central role in accounts of stress, timing, and segmental organisation across languages. Historically, two representational approaches have dominated theory and description. The onset–rime model parses each syllable into an initial consonantal margin (the onset) and a rime consisting of the nucleus plus any following consonants (the rime or rhyme), a partition that has figured in both psycholinguistic studies of rhyme and in formal phonology. (Duanmu, 2008). Under the onset–rime conception, the onset is "an optional initial consonant (or cluster) of the syllable", while the rime contains the nucleus and the coda; the rime is the locus of many rhyme-based patterns and of phonological processes sensitive to vowel + coda combinations (e.g., rhyme matching and stress assignment). (Geudens, 2005).

By contrast, moraic models reframe weight and timing in terms of smaller timing units, morae, rather than onset/rime constituents. As compactly stated in the moraic tradition, "a syllable must contain at least one mora," and syllables are classified as light (one mora) or heavy (two or more morae), a distinction that predicts stress, compensatory lengthening, and other weight-sensitive phenomena. (Hyman, 1985). Moraic accounts explain a range of empirical patterns, such as why long vowels behave differently from short vowels or why certain codas contribute to weight by assigning moraicity to specific segments (nuclei and, in some analyses, codas). Work on compensatory lengthening and mora preservation further developed this approach by showing how mora-counting explains alternations that surface when segments are lost or lengthened (Hayes, 1989).

Contemporary frameworks (for example, Optimality Theory) have provided tools to compare and sometimes reconcile these representations by recasting syllable-related generalizations as ranked constraint interactions rather than as strictly rule-based manipulations of a single constituent structure; OT analyses have therefore been influential in reframing debates about whether onset–rime or moraic primitives are the more explanatorily powerful or empirically appropriate choice for particular languages (Prince & Smolensky / McCarthy & Prince, 1993). This plurality of representational choices motivates the present study: to evaluate new empirical findings and formal arguments that bear on when and why onset–rime versus moraic analyses succeed or fail in accounting for cross-linguistic patterns of weight, stress, and segmental distribution.

Significance of the Study

This study is valuable because it revisits two major models of syllable structure at a time when cross-linguistic phonological data are expanding, and theoretical assumptions are being reassessed. By comparing the onset–rime and moraic approaches, the research helps clarify which representational units offer stronger explanatory power for weight-sensitivity, timing, and stress behaviour across languages. A clearer understanding of these structures supports more accurate phonological analysis, especially in languages whose patterns do not fit neatly into one model. The study also provides practical benefits for areas that rely on precise modelling of syllables, including second-language pronunciation teaching, speech technology, and computational phonology. By highlighting the strengths and limitations of each model, the project encourages more flexible and data-driven representations in current phonological theory. It contributes to the broader effort to refine how linguistic structure is formally described.

Research Objectives

To examine the explanatory strengths and limitations of the onset–rime and moraic models in accounting for syllable weight, timing, and stress across selected languages.
To evaluate which representational model provides more consistent and predictive analysis for weight-sensitive phonological patterns in contemporary phonological theory.

Research Questions

How effectively do the onset–rime and moraic models explain cross-linguistic patterns related to syllable weight, timing, and stress?
Which model onset–rime or moraic offers a more coherent and predictive representation for weight-sensitive phonological phenomena in current theoretical analysis?

Literature Review

The study of syllable structure is central to phonological theory because syllables serve as a domain for a wide range of phonological phenomena stress, timing, weight, and segmental interactions. Over the decades, two dominant representational frameworks have been developed: the onset–rime model and the moraic model. These frameworks differ not just in their constituent structure, but in how they conceptualise weight, timing, and phonological processes. This literature review surveys key work in both approaches, their empirical support, theoretical debates, and how more recent frameworks (particularly Optimality Theory) attempt to reconcile or choose between them.

Foundations of Onset–Rime Structure

The onset–rime model posits that the syllable is composed of two major constituents: the **onset**, which consists of any initial consonant(s), and the **rime**, which includes the vowel nucleus and any following consonants (the coda) (Treiman & Kessler, 1995). Empirical support for this model comes from psycholinguistic experiments: for example, Treiman, Kessler, and others found that even when participants are not explicitly taught a syllable structure, they tend to segment syllables at the boundary between onset and rime (Treiman & Kessler, 1995; Treiman & Zukowski, as cited in Richardson) In particular, Treiman and Kessler (1995) argued that word-game data support an onset–rime representation, showing that speakers naturally divide syllables at the onset–rime boundary even under minimal training (Treiman & Kessler, 1995)

Structural linguistic analyses also support onset–rime. Selkirk (1982) proposed a binary-branching syllable structure in which the rime is a constituent dominating both the nucleus and the coda. Duanmu (2008) traces how this representation underpins metrical phonology: the binary structure allows for the distinction between light and heavy syllables via branching in the rime (nucleus + coda) (Duanmu, 2008) The internal relational constraints among the rime's components also bear out: there tend to be more phonotactic restrictions between nucleus and coda than between onset and nucleus, which suggests that coda and nucleus form a tighter constituent (Davis, 2001) Goldsmith (2009), meanwhile, argued from a more formal perspective that the onset–rime structure correctly predicts patterns of co-occurrence restrictions in many languages: if rhyme is a constituent, then the co-dependence of nucleus and coda is expected, and indeed observed (Goldsmith, 2009). Steriade (2002) also provides a clear exposition of the onset–nucleus–coda (O-N-C) model, noting that this tripartite structure (onset, nucleus, coda) remains widely used in theoretical phonology (Steriade, 2002).

While the onset–rime model has strong descriptive appeal, it has been challenged. Pierrehumbert and Nair (1995) argued for a moraic representation for English syllables, suggesting that certain weight phenomena are better captured in terms of mora assignments rather than rime branching (Pierrehumbert & Nair, as cited in Treiman & Kessler), In response, Treiman and Kessler defended the onset–rime model, arguing that the experiments originally cited by Pierrehumbert and Nair do not conclusively require a moraic representation (Treiman & Kessler, 1995).

Moraic Theory and Syllable Weight

The moraic model emerged largely to give formal shape to syllable weight, a concept that plays a critical role in metrical phonology. In this framework, moras (often symbolised μ) serve as "weight-bearing units." A light syllable typically has one mora; heavy syllables have two; some languages even allow super-heavy syllables with three or more (Hyman, 1985) Larry Hyman's A Theory of Phonological Weight is a seminal work in this tradition: he argues that syllable representations should be built on a weight tier, where each relevant segment (such as a vowel or coda consonant) links to a mora. He further demonstrates these ideas using phenomena from Gokana, showing that even languages with marginal syllabic structure can be analysed via moras (Hyman, 1985).

Compensatory lengthening provides strong empirical support for moraic theory. In his influential 1989 paper, Hayes formalized a Weight-by-Position rule: certain codas receive a mora ("Weight by Position"), and when those codas are deleted historically or synchronically, the preceding vowel lengthens to preserve the mora count (Hayes, 1989) A classic example comes from Turkish: in certain contexts, deletion of a coda consonant is followed by vowel lengthening precisely because that coda was moraic (Hayes, 1989) Phonetic work also supports the notion of moras. Cohn (2003) argued that word-internal prosodic organization reflects moraic structure: she showed that duration correlates with mora count, indicating that even in phonetic realization moras are relevant units (Cohn, 2003) Similarly, Broselow, Chen, and Huffman (2002) in their study of syllable weight across languages assumed a moraic representation and showed that coda consonants function as exclusive dependents of their own moras, whereas weightless consonants share a mora with the preceding vowel (Broselow, Chen & Huffman, 2002)

Typological and Theoretical Variations of Moraic Theory

Moraic phonology is not monolithic. Some languages clearly treat codas as moraic, but others do not. For example, Hyman (1985) and subsequent researchers acknowledge a parameterisation: in some languages, codas bear moras, in others they do not (Hyman, 1985). The parameter is crucial because it explains cross-linguistic variation in weight-sensitive phenomena. Rosenthall (1999) offered an important constraint-based perspective. In his work "Weight-by-Position by Position," he argued that the behaviour of closed syllables (CVC) vs. long vowels (CVV) in certain languages can be described using Correspondence Theory within Optimality Theory. He claimed that different types of correspondence constraints account for when closed syllables are contextually heavy or light, and when long vowels pattern similarly or differently (Rosenthall, 1999).

From a typological standpoint, Kager and Martínez-Paricio (2018) examined mora vs. syllable accentuation in stress languages and proposed that internally layered (IL) feet in metrical theory can account for "mora-counting" patterns, for instance where stress is assigned based on mora count rather than syllable count (Kager & Martínez-Paricio, 2018) Lunden (2020) revisited how syllable weight works at the right edge of words and found that in certain languages codas are treated as heavy in some processes but not others a result that challenges the simplicity of classical moraic assumptions (Lunden, 2020).

Integrating Onset–Rime and Moraic Theories in Optimality Theory

With the advent of Optimality Theory (OT) in the early 1990s, linguists gained new tools to formalise syllable structure in a way that doesn't commit to rigid constituency but instead uses constraint interactions (Prince & Smolensky, 1993). In OT, different candidate syllabifications compete, and the optimal one is chosen based on ranked constraints (Prince & Smolensky, 1993). OT analyses have been applied to syllable structure in ways that incorporate both onset–rime and moraic representations. For instance, the Syllable in Optimality Theory (a volume edited on this topic) demonstrates how OT can solve classical problems of syllable structure (Goodman & others, 2003). Similarly, An Optimality-theoretic Approach to Superheavy Syllables (in QA) applies moraic theory within OT, maintaining that only nucleus and coda contribute to mora count (onsets do not), which aligns with classical moraic theory (Hyman, McCarthy & Prince) (ScieduPress, 2022).

Moreover, faithfulness constraints in OT allow for different mapping relations, including between prosodic structures. McCarthy (1995) reformulated faithfulness constraints in terms of prosodic circumscription, arguing that correspondence can be established not only between underlying and surface forms, but also between different levels of prosodic structure (McCarthy, 1995). Computational approaches within OT have also engaged directly with syllabification. Hammond (1997) showed that it is possible to implement an OT parser that produces candidate syllabifications and evaluates them against constraints like ONSET or NOCODA (Hammond, 1997). Gerdemann and van Noord (2000) extended this work, presenting a finite-state implementation of OT with gradient constraints and applying it to syllabification processes (Gerdemann & van Noord, 2000).

Empirical Challenges and Refinements

Despite this rich theoretical development, both models face empirical challenges.

Challenges for Onset–Rime

One objection to the onset–rime model comes from languages that do not show clean branching behaviour in the rime. For instance, cross-linguistic evidence suggests that the assumption of a universal binary structure (i.e., that every syllable has a rime constituent dominating nucleus and coda) does not always hold (Duanmu, 2008). Furthermore, distributional data for English from Treiman (1988) indicate that nucleus–coda dependencies are stronger than onset–nucleus dependencies, supporting a constituent view of rime (Treiman, 1988). Also, phonetic evidence complicates a purely structural onset–rime account. Mai (2020) conducted a production study demonstrating that onset complexity influences duration, intensity, and F0 contours of English monosyllables in systematic ways. She concluded that onset complexity affects weight gradients in a way that is not wholly captured by categorical constituency (Mai, 2020).

Challenges for the Moraic Model

The moraic model, while robust, also faces challenges. One important debate concerns which codas count as moraic. The classical moraic theory (Hyman, 1985; Hayes, 1989) treats only certain codas as moraic, but more recent work (e.g., Rosenthall, 1999) argues that the assignment of moras is not uniform but process-specific, depending on how correspondence constraints interact. Rosenthall's analysis shows that closed syllables sometimes pattern as heavy and sometimes as light, depending on the constraint ranking (Rosenthall, 1999). Another empirical complication comes from the alignment of moraic theory with phonetics. Lunden (2020) shows that in some languages, coda weight does not behave consistently in all processes, calling into question a monolithic moraic representation (Lunden, 2020). Similarly, Cohn (2003) pointed out that while duration correlates with moraic structure, the mapping is not always transparent, and some languages show phonetic manifestations of mora that are gradient rather than categorical (Cohn, 2003.

Reconciling the Models: Hybrid and Process-Specific Approaches

Given the empirical strengths and weaknesses of both models, many contemporary researchers favour hybrid or process-specific accounts. One route is to maintain a moraic representation but to allow its parameters to vary depending on the phonological process under consideration. For example, Uniform Moraic Quantity (UMQ) theory, as elaborated by some phonologists, proposes that codas always receive moras but that different processes exploit different subsets of those moras (Cambridge Core; Rosenthall's revisitation). Kager and Martínez-Paricio (2018) argued for a metrical theory in which internally layered feet count moras rather than syllables, thereby integrating mora-counting into stress placement (Kager & Martínez-Paricio, 2018). This hybrid approach captures how stress systems in certain languages (e.g., Gilbertese, Japanese) are sensitive to mora count rather than syllable count.

OT provides another integrative strategy. Within OT, one can posit constraints that Favour moraic structure (e.g., weight constraints) alongside constraints that favour onset–rime structure (e.g., ONSET, CODA, structural well-formedness). The interaction of these constraints determines surface syllable structure without committing strictly to one constituent model (Prince & Smolensky, 1993. Indeed, McCarthy & Prince's correspondence theory allows faithfulness at the prosodic level, so that even if the underlying structure is moraic, the surface form can show constituency consistent with onset–rime (McCarthy, 1995). Finally, computational approaches in OT further allow testing of candidate structures. Hammond (1997) and Gerdemann & van Noord (2000) demonstrated that it is feasible to algorithmically generate and evaluate syllabification candidates under different constraint rankings (Hammond, 1997; Gerdemann & van Noord, 2000).

Psycholinguistic and Developmental Evidence

Psycholinguistic experiments provide critical evidence for onset–rime constituency. As mentioned, Treiman and Kessler's word game experiments show that even untrained participants segment syllables at the onset–rime boundary (Treiman & Kessler, 1995). In developmental contexts, younger children (ages 4–5) show better recognition and manipulation tasks when stimuli are built on onset–rime units rather than individual phonemes, suggesting that onset–rime may be more cognitive-pragmatic early in phonological development (Treiman, 1985, as cited in Language in India). On the other hand, the moraic timing perspective has psycholinguistic consequences as well. For example, recent work in infant-directed speech in Japanese shows that amplitude modulation structure tracks moraic timing: infants' brains may align with moraic units in rhythmically structured speech (Daikoku & Goswami, 2025). Such findings suggest mora-based temporal units are not just theoretical abstractions but have acoustic and perceptual reality.

The literature on syllable structure reveals a rich and ongoing debate between the onset–rime and moraic models. The onset–rime framework, grounded in constituent structure, explains psycholinguistic segmentation and co-occurrence patterns. The moraic model, by contrast, offers a powerful way to formalise syllable weight, compensatory lengthening, and timing via mora counting. However, neither model fully accounts for all empirical data on its own. Contemporary theorists increasingly favour hybrid, process-specific, or constraint-based accounts, particularly within the framework of Optimality Theory, to reconcile these differences. Further empirical work, typological, phonetic, developmental, and computational, is required to refine our understanding of how these representations operate in human language.

Methodology

Research Design

This study uses a qualitative comparative design drawn from theoretical phonology. It applies two models, the onset–rime model and the moraic model, to the same dataset of English words. The objective is to assess how each model represents syllable structure, assigns weight, and predicts stress behaviour. This comparative approach enables a clear evaluation of the relative strengths and weaknesses of each theoretical framework under identical data conditions.

Data Source and Sampling

The data comprise English lexical items selected from standard pronunciation dictionaries and common frequency lists. The sampling is purposive: words were chosen to represent a variety of syllable shapes, including open syllables with short vowels, syllables with long vowels or diphthongs, closed syllables ending in consonants, and syllables with complex codas (including superheavy forms). The dataset also includes polysyllabic words and derivational pairs known for stress alternation. This selection ensures that the dataset covers a wide range of syllable types relevant for testing weight-sensitive phenomena in English.

Analytical Framework

Two parallel coding procedures were implemented, one for each phonological model:

Onset–Rime Segmentation: Each syllable was divided into an onset (if present), a nucleus, and a coda. Syllable division followed the maximal onset principle, ensuring that permissible English consonant clusters were assigned to the onset. The rime (nucleus plus coda) was then analysed to determine whether it was simple (just nucleus), had a branching nucleus (i.e., long vowel or diphthong), or included a coda consonant.

Moraic Representation: Each syllable was also recoded in terms of morae. Short vowels were assigned one mora; long vowels or diphthongs were assigned two morae; codas were assigned a mora under the assumption that in English they contribute to weight (the “weight-by-position” assumption within the moraic framework) (Hayes, 1989; Hyman, 1985). The resulting moraic structure allowed classification of syllables as light (one mora), heavy (two morae), or superheavy (three or more morae, in cases of coda clusters or long vowel plus coda)
Each word was represented in both frameworks, enabling direct comparison of how each model accounts for syllable shape, weight, and stress potential.

Evaluation Criteria

After coding, the two representations were evaluated against the following criteria:
Structural representation: how well the model captures permissible segmental combinations and syllable shapes in English.
Weight representation: how precisely the model distinguishes between light, heavy, and superheavy syllables.

Stress prediction: the degree to which the model's representation corresponds to actual stress patterns in English polysyllabic and derivational forms.
Consistency across syllable types: how reliably the model handles simple, complex, long-vowel, coda, and cluster syllable shapes.

Reliability and Theoretical Grounding
The methodology draws on established theoretical principles. The onset–rime model reflects classical syllable constituency, while the moraic model follows the framework developed by Hyman (1985) and refined by Hayes (1989), in which morae serve as basic units of weight and timing (Hyman, 1985; Hayes, 1989). The coding procedure was tested on a small subset of data before being applied to the entire dataset to ensure consistency. Ambiguous cases, such as syllables with complex codas or diphthongs, were carefully reviewed to avoid misclassification.

Data Analysis
This section presents the detailed analysis conducted to compare how the onset–rime model and the moraic model account for English syllable structure. The analysis aims to evaluate the descriptive depth, predictive accuracy, and theoretical strengths of each framework by applying it to diverse sets of English syllables. The chapter moves through the entire analytical process: preparing the data, applying both models systematically, comparing the outcomes, and interpreting the theoretical implications. The goal is not only to contrast two competing models but also to explain what the English data reveal about the nature of syllable structure.

Analysis Under the Onset–Rime Model
The onset–rime model approaches the syllable as a hierarchical unit composed of two major constituents: the onset and the rime, with the rime branching into the nucleus and the coda. This section analyses the English data through this framework to determine how well it captures structural patterns and weight-related behaviour. Earlier phonological research treats the onset–rime division as central to understanding syllable segmentation, phonotactic constraints, and prosodic structure (Blevins, 2003; Selkirk, 1982). Applying this model to English helps evaluate whether a binary rime-based system accurately reflects the language's patterns of stress, weight, and coda behaviour.

Identifying Onset and Rime Boundaries
The first analytical step involved applying the maximal onset principle, which assigns the largest possible consonant cluster to the onset provided the resulting combination is phonotactically legal in English. Acceptable clusters such as /pl-/, /tr-/, /sk-/, and /st-/ were assigned to the onset, whereas unattested combinations like /tl-/ or /sr-/ were avoided. This principle was especially important for ambiguous items like extra and window, where competing syllabification choices often appear in casual speech.
Each syllable in the dataset was annotated for:
Onset: a consonant, consonant cluster, or zero
Nucleus: a vowel or diphthong
Coda: one or more consonants, or zero
The onset–rime structure offered a straightforward method for segmenting English syllables. Once structural divisions were established, the analysis focused on

determining how rhyme configuration related to syllable weight.

Table 1
Syllable Segmentation of Selected English Words under the Onset–Rime Model

Word	Syllabification	Onset	Nucleus	Coda	Rime Type
city	/ˈsɪ.ti/	s	ɪ	Ø	**Non-branching**
team	/tiːm/	t	iː	m	**Branching nucleus**
cat	/kæt/	k	æ	t	**Branching rime**
align	/əˈlaɪn/	l	aɪ	n	**Branching nucleus+rime**
motion	/ˈmoʊ.ʃən/	m	oʊ	Ø	**Branching nucleus**

Rime Branching and Syllable Weight

After segmentation, the rime of each syllable was coded using three structural categories:

Non-branching rime: contains only a short vowel (CV).

Branching nucleus: contains a long vowel or diphthong (CVV).

Branching rime: contains a coda consonant or consonant cluster (CVC, CVCC).

This classification allowed examining whether branching within the rime corresponded to weight behaviour, especially in relation to stress. English often treats syllables with either long vowels or codas as heavy, and heavy syllables tend to attract stress. Examples from the dataset included:

a.lign (heavy final syllable receives stress)

compare (branching rime attracts stress)

a.lign.ment (presence of coda consonant contributes to rime branching)

The analysis showed that the onset–rime model accounted for many of these patterns. Both types of branching—nuclear and coda-based were linked to stress assignment. Long vowels and closed syllables behaved similarly, supporting the traditional claim that branching rimes signal weight in English.

Limitations Revealed by the English Data

Although the onset–rime model captured many expected patterns, several aspects of English phonology revealed clear limitations in a strictly binary rime-based system.

Unstressed heavy syllables

Words like nation and motion contain long vowels or diphthongs in their first syllable, yet they appear unstressed in the surface form. Even though the rhyme branches, stress does not appear, which contradicts the expectation that all branching rhymes are heavy and stress-attracting.

Morphologically conditioned stress shifts

Pairs such as:

photógraph → phótograph-er

re.córd (verb) → réc.ord (noun)

suggest that stress interacts with morphological structure or derivational environment. This behaviour weakens the assumption that weight alone drives stress patterns.

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Reduced vowels inside closed syllables

In words such as lemon (/ˈlɛm.ən/), the second syllable ends with a nasal consonant but contains a reduced vowel. The presence of a coda does not create a heavy rime, which shows that codas do not consistently function as weight-bearing in English. These observations indicate that English weight is not fully captured by a binary model of rime branching. Instead, English exhibits gradience, where certain structures behave as heavy in some contexts but not in others. The onset–rime model's categorical distinctions are not always sensitive to these nuances.

Analysis Under the Moraic Model

The moraic model approaches the syllable as a prosodic unit composed of morae rather than solely as branching constituents. In this framework, weight is not determined by structural divisions such as the rime but by the number of morae each syllable carries. English behaves as a partially weight-sensitive language where both long vowels and coda consonants can contribute to weight (Hayes, 1989; Hyman, 1985). Applying the moraic model to English data allows for a fine-grained distinction between light, heavy, and superheavy syllables, providing a detailed way to evaluate their behaviour in stress assignment, timing, and rhythmic structure.

The analysis followed three basic assumptions commonly used for English:

Short vowels count as one mora (μ).
Long vowels and diphthongs count as two morae (μμ).
Coda consonants contribute one mora (μ) in analyses where codas are weight-bearing.

These assumptions were used to recode each syllable in the dataset, producing a mora-based representation that could then be applied to patterns of stress and prosody.

Mora Assignment in English Syllables

Each English syllable in the dataset was represented as a sequence of morae. This process helped distinguish syllable types in greater detail than the onset–rime segmentation allowed. The examples below illustrate how the mora assignment was carried out:

city → /ˈsɪ.ti/ → CV (μ), CV (μ)
team → CVV (μμ)
cat → CVC (μμ)
storm → CVCC (μμμ or μμ, depending on whether coda clusters count as single or multiple morae)

This encoding not only showed how many morae each syllable contained but also highlighted how the mora count influenced stress and syllable timing.

Table 2
Mora Assignment for Selected English Syllables Under the Moraic Model

Word	Phonemic Form	Syllable Type	Moraic Structure	Weight Classification
city	/ˈsɪ.ti/	CV, CV	μ, μ	Light + Light
team	/tiːm/	CVV	μμ	Heavy
cat	/kæt/	CVC	μμ	Heavy

storm	/stɔːrm/	CVCC	μμμ or μμ	Superheavy or Heavy
pie	/paɪ/	CVV	μμ	Heavy

Weight-Sensitive Patterns as Mora-Based

Once the mora assignment was complete, the dataset was analysed for weight-sensitive behaviour. English stress patterns align closely with moraic distinctions:

Heavy Syllables and Stress

Syllables with two morae, either from long vowels or from coda consonants, were strongly associated with stress. Words such as team, cat, and pie consistently appeared in stressed positions when compared to neighbouring syllables with a single mora.

Light Syllables in Non-Initial Position

Light syllables (one mora) seldom carry stress unless positioned at the beginning of a word, where English sometimes assigns initial default stress. This supported the idea that mora count interacts with metrical structure rather than functioning in isolation.

Long Vowels as Stable Indicators of Weight

Long vowels were the most reliable markers of weight across all items. Regardless of phonological environment, syllables with long vowels behaved as heavy, confirming their status as bimoraic.

Rhythmic and Timing Evidence

English rhythm also supports mora-based distinctions. For example:
function words (e.g., a, to, the) often undergo reduction because they form subminimal structures
English minimal word constraints require at least two morae to form an independent prosodic word
These patterns show that mora count is more closely tied to rhythmic organisation than rime branching alone.

Moraic Stability in Stress Shifts

The moraic model further explained stress shifts that are common in English lexical pairs. For example:
noun–verb alternations
pro.test (noun) → stress on heavy first syllable
pro.test (verb) → shift due to reweighting in derivational structure

derivational stress alternations
record (noun) vs. record (verb)
permit (noun) vs. permit (verb)
Changes in stress often align with underlying changes in syllable weight triggered by vowel reduction, affixation, or morphological restructuring. In many cases, the moraic representation predicted these shifts better than the onset–rime model because it accounted for alterations in mora count rather than relying on binary branching.
Thus, the moraic model demonstrated a higher degree of stability across derivational environments, supporting its value as a predictive tool for stress behaviour.

Comparative Evaluation of Both Models

This section compares the onset–rime model and the moraic model using the same English dataset. The goal was to evaluate how each framework handled structural segmentation, weight representation, and stress prediction. Both models provided useful insights, but they diverged in how effectively they captured prosodic and phonotactic patterns in English. The comparison highlights the complementarities and limitations of each theoretical approach.

Structural Adequacy

The onset–rime model divides the syllable into onset and rime, offering a simple structure that aligns with traditional phonological teaching. This model proved helpful for describing English phonotactics, especially constraints on onset clusters and permissible coda combinations. Its clear segmentation made it easy to code each syllable in the dataset. However, its binary treatment of rime branching did not provide enough detail to capture the graded nature of English syllable weight. Since weight is assigned based on the rime as a whole, long vowels, diphthongs, and codas were grouped under broad categories that limited the model's representational depth

The moraic model, by contrast, assigns morae to individual segments, producing a more fine-grained representation. English short vowels were treated as monomoraic, long vowels and diphthongs as bimoraic, and codas as additional weight-bearing units. This allowed the model to distinguish between syllables like CVV and CVC, both considered heavy in the onset–rime model but represented differently in moraic terms. The added granularity made the moraic model stronger for analysing weight-sensitive phenomena. Still, its structure sometimes obscured the intuitive onset–rime boundary division that English speakers perceive in tasks such as rhyme recognition.

Predictive Accuracy for English Stress

The dataset was used to test how well each model predicted stress assignment in English polysyllabic words. English stress rules rely heavily on weight, and this made the moraic model a closer fit for most examples. Syllables with two morae, especially those containing long vowels or diphthongs, reliably attracted stress. Codas also contributed to weight in ways that the moraic model could represent directly.

The onset–rime model captured phonotactic shape but performed less well in predicting stress. Because it treats all branching rhymes similarly, it does not distinguish between sources of weight. For instance, CVVC and CVCC syllables both counted as branching rimes, even though they behaved differently in stress assignment. The lack of granularity reduced its predictive accuracy. The moraic model displayed clearer alignment with English stress patterns across derivational forms and variable word classes.

Handling of Superheavy Syllables

Superheavy syllables in English, such as CVVC and CVCC, were important test cases. The onset–rime model struggled here because it treated both types simply as branching rimes. Differences in timing, stress attraction, and rhythmic prominence were not captured clearly. These differences matter for English because CVVC syllables usually behave as heavier than CVC, while CVCC patterns can vary depending on the morphological environment.

The moraic model handled these distinctions more effectively. CVVC syllables were regularly coded as trimoraic, while CVCC syllables could be represented as either bimoraic or trimoraic depending on the analysis and the sonority of the coda consonants. This flexibility aligned better with the observed data. The model was able to explain why some superheavy syllables consistently attracted stress and why others were more variable. It also accounted for timing differences, which helped interpret rhythmic structure across longer words.

Table 3
Comparison of Onset–Rime and Moraic Models Based on English Data

Criterion	Onset–Rime Model	Moraic Model
Structural representation	Simple and intuitive segmentation into onset and rime	**Detailed segmentation into morae for vowels and codas**
Representation of weight	Binary (branching vs. non-branching rime)	**Gradient (one, two, or three morae)**
Stress prediction	Moderate accuracy	**High accuracy due to mora-based weight**
Treatment of superheavy syllables	Limited distinction between CVVC and CVCC	**Clear differentiation based on mora count**
Phonotactic explanation	Strong for onset and coda restrictions	**Moderate; less intuitive for cluster constraints**
Alignment with English timing	Limited	**Strong, supports rhythmic analysis**

Findings

The analysis showed that the onset–rime model offered a useful structural description of English syllables but lacked the detail needed to fully explain weight-sensitive patterns. It successfully captured the phonotactic organisation of English, especially how consonants cluster in onsets and how rimes shape permissible syllable forms. However, because it treats rime branching as a binary feature, it could not distinguish between different sources of weight, such as long vowels, diphthongs, and consonant codas. This restricted its ability to explain stress placement in many English words, where fine differences in vowel length and coda structure play a central role. The onset–rime model, therefore, proved most effective for structural segmentation rather than prosodic prediction.

The moraic model produced stronger results in identifying and predicting weight-based behaviour in English. By assigning morae to short vowels, long vowels, diphthongs, and codas, the model captured subtle contrasts that affect stress, timing, and rhythmic prominence. Heavy and superheavy syllables were represented more accurately, and their behaviour aligned closely with patterns described in English prosodic theory. The model also explained stress shifts in derivational pairs and morphologically complex words, showing how changes in mora count influence prosodic outcomes. Overall, the moraic framework offered more precise predictive power across the dataset, especially for polysyllabic stress assignment.

A comparison of the two models revealed that each contributed distinct insights. The onset–rime model excelled in describing the structural composition of English syllables and remained valuable for explaining phonotactic constraints. The moraic model, however, provided clearer and more consistent explanations for weight-sensitive phonological processes. English syllable weight behaved more like a gradient, which the moraic model captured more effectively than the binary onset–rime system. Together, the findings suggest that a hybrid understanding may be most appropriate for English: onset–rime divisions help describe structural patterns, while moraic representations better explain prosodic behaviour and stress assignment.

Conclusion

The study concludes that while both the onset–rime and moraic models offer valuable perspectives on English syllable structure, the moraic model provides a more accurate account of weight-sensitive patterns such as stress assignment, timing, and rhythmic prominence. The onset–rime model remains useful for describing phonotactic organisation and structural segmentation, particularly in outlining permissible onsets and rimes. However, its binary treatment of weight limits its ability to explain the gradient distinctions found in English. The moraic model's finer representation of syllable weight allows it to capture the behaviour of heavy and superheavy syllables more consistently. Taken together, the findings suggest that English phonology benefits from a dual approach in which onset–rime structures describe the form of syllables, while moraic representations account for their prosodic behaviour.

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