

## SPEECH RHYTHM VARIATION IN TYPOLOGICALLY DIFFERENT LANGUAGES: ACOUSTIC AND PHONETIC APPROACHES

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### Annotation

This paper examines speech rhythm variation in typologically different languages, focusing on English as a stress-timed language and Ibibio as a syllable-timed language, as well as varieties of English such as British and Nigerian English. It discusses the challenges of measuring rhythm in acoustic speech signals and highlights the use of quantitative methods such as the Pairwise Variability Index (PVI). The study also considers focal and non-focal speech components in rhythm analysis. The results show clear differences between stress-timed and syllable-timed languages, confirming rhythm as an important phonetic feature

**Key words** :Speech rhythm, stress-timed language, syllable-timed language, English phonetics, Ibibio language, acoustic phonetics, Pairwise Variability Index (PVI)

**Аннотация:** В данной статье рассматриваются различия речевого ритма в типологически разных языках, таких как английский язык (стресс-таймированный) и язык ибибио (слоговой ритм), а также варианты английского языка, включая британский и нигерийский английский. Обсуждаются трудности акустического измерения ритма и современные количественные методы, такие как индекс парной вариативности (PVI). Также рассматриваются фокальные и нефокальные компоненты речи. Результаты показывают четкие различия между стресс-таймированными и слоговыми языками.

**Key words** :Speech rhythm, stress-timed language, syllable-timed language, English phonetics, Ibibio language, acoustic phonetics, Pairwise Variability Index (PVI)

**Annotatsiya:** Ushbu maqolada tipologik jihatdan farq qiluvchi tillarda nutq ritmining o'zgarishi o'rganiladi. Xususan, ingliz tili stress-timed (urg'uga asoslangan) til sifatida, Ibibio esa syllable-timed (bo'g'inga asoslangan) til sifatida tahlil qilinadi. Shuningdek, Britaniya va Nigeriya ingliz tili variantlari ham ko'rib chiqiladi. Maqolada nutq ritmini akustik jihatdan aniqlashdagi muammolar va Pairwise Variability Index (PVI) kabi zamonaviy o'lchov usullari yoritiladi. Tadqiqot natijalari tillar o'rtasida sezilarli ritmik farqlar mavjudligini ko'rsatadi.

**Kalit so'zlar:** Nutq ritmi, stress-timed til, syllable-timed til, ingliz fonetikasi, Ibibio tili, akustik fonetika, Pairwise Variability Index (PVI)

### INTRODUCTION

Speech rhythm is a central concept in phonetics and phonology. It refers to the temporal organization of speech, specifically the pattern of strong and weak elements over time. Linguists have long observed that languages of the world differ in rhythm types, commonly classified as stress-timed, syllable-timed, and sometimes mora-timed languages.

English is traditionally considered a stress-timed language, while languages such as Ibibio are classified as syllable-timed. However, rhythm variation is not only observed between

different languages but also within different varieties of the same language, such as British English and Nigerian English.

Despite many studies, capturing rhythm differences using acoustic data has proven challenging. This article explores previous research and focuses on a more reliable quantitative approach to rhythm measurement

### 1. Definition of Speech Rhythm

Speech rhythm can be defined as:

“The recurrence of a perceivable temporal patterning of strongly marked (focal) and weakly marked (non-focal) values of a parameter within a relatively constant temporal environment.”

This definition emphasizes that rhythm is based on the repetition of strong and weak elements in speech over time. These elements may include pitch, stress, or duration patterns.

Rhythm can appear in simple binary forms (strong vs weak) or in more complex structures, similar to patterns found in music and poetry.

### 2. Typological Differences in Rhythm

Languages differ significantly in their rhythmic organization:

Stress-timed languages (English):

Rhythm is based on stressed syllables.

Time intervals between stressed syllables tend to be relatively equal.

Unstressed syllables are reduced or shortened.

Speech sounds uneven but natural.

Syllable-timed languages (Ibibio, Uzbek, etc.):

Each syllable has approximately equal duration.

Less reduction of unstressed syllables.

Speech sounds more regular and even.

These differences make English rhythm more dynamic, while syllable-timed languages sound more steady and predictable.

### 3. Acoustic Measurement of Rhythm

One of the main challenges in phonetics is measuring rhythm objectively. Early impressionistic studies were not sufficient because rhythm is difficult to observe directly in acoustic signals.

To solve this problem, researchers developed quantitative methods such as:

Pairwise Variability Index (PVI)

The PVI measures the difference in duration between successive speech units (usually syllables). It calculates how much variation exists in timing.

*High variability* → *stress-timed rhythm (e.g., English)*

*Low variability* → *syllable-timed rhythm (e.g., Ibibio)*

This method provides a more scientific way to compare languages.

### 4. Focal and Non-Focal Components

*Another important concept in rhythm analysis is the distinction between:*

*Focal elements: strongly marked (stressed) components*

*Non-focal elements: weakly marked (unstressed) components*

These components can be based on pitch, stress, or duration patterns. The interaction between focal and non-focal elements creates the overall rhythm of speech.

### 5. Technological Implementation

Modern studies often use software tools to analyze speech rhythm. These tools:

Accept labeled speech data (e.g., ESPS/Waves+ files)

Measure syllable durations

Calculate duration differences

Compute rhythm indices like PVI

Classify syllables into focal and non-focal categories

Such computational methods allow more accurate and large-scale analysis of speech rhythm across languages.

### 6. Research Findings

Studies show that:

English demonstrates strong stress-timed characteristics.

Ibibio shows clear syllable-timed patterns.

Nigerian English may show intermediate or mixed rhythm features.

These findings confirm that rhythm is not only a theoretical concept but also a measurable phonetic feature

### **CONCLUSION**

In conclusion, speech rhythm is an essential feature of human language that varies across linguistic systems. English and Ibibio represent two different rhythmic types: stress-timed and syllable-timed. Although rhythm is difficult to measure acoustically, modern methods such as the Pairwise Variability Index provide reliable tools for analysis.

The study of rhythm not only helps classify languages but also improves understanding of pronunciation and speech production. Therefore, rhythm analysis is an important field in both theoretical and applied linguistics.

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