

THE POSITION OF THE TONGUE IN PHONETICS AND ITS IMPACT ON SPEECH PRODUCTION

M. Davlatova ¹

(Scientific supervisor: Erdanova Zebiniso Abilkosimovna, Doctor of Philosophy on
Philological Sciences (PhD))

Abstract:

The tongue plays a pivotal role in the production of speech sounds. Its positioning significantly impacts the articulation of vowels and consonants in various languages. This thesis explores the intricate relationship between tongue positioning and phonetic output, focusing on how the tongue's movement and placement influence sound production. The research draws upon theories in phonetics, supported by acoustic analysis and articulatory studies, to demonstrate the relevance of the tongue's position across linguistic systems. Additionally, this work delves into the physiological structure of the tongue, its versatility in sound production, and its influence on linguistic variation.

Key words: tongue, phonetics, articulation, vowels, consonants, sound production, acoustic phonetics, speech physiology.

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Introduction: Phonetics, the study of speech sounds, involves understanding how these sounds are produced, transmitted, and perceived. Central to speech production is the human tongue, which, due to its mobility and versatility, plays a crucial role in shaping the sounds of languages. The tongue's position—whether it is raised, lowered, fronted, or retracted—determines the characteristics of different sounds, particularly vowels, but also affects consonants. This thesis explores the role of the tongue in phonetics, with particular emphasis on how its position influences sound production.

Physiology of the Tongue in Speech

The tongue is a highly flexible muscular organ, comprised of intrinsic and extrinsic muscles that allow for a wide range of movements. Its shape and position can change dynamically to form various sounds. The intrinsic muscles, such as the superior longitudinal, inferior longitudinal, transverse, and vertical muscles, are responsible for fine adjustments within the tongue, while the extrinsic muscles, such as the genioglossus, hyoglossus, styloglossus, and palatoglossus, control the movement of the tongue in the oral cavity. In speech production, the tongue's interaction with other articulators like the teeth, alveolar ridge, and palate defines the quality of the sound. The tongue's ability to alter its configuration is essential for differentiating between speech sounds across languages. The flexibility of the tongue,

¹ Davlatova Mavluda Xudoyberdi qizi, Student

coupled with its capability to rapidly shift from one articulation to another, is a defining characteristic of human speech. Key Functions of the Tongue in Speech:

Articulation of Sounds: The tongue creates different speech sounds by altering its position within the mouth. It works in coordination with the teeth, lips, and palate to articulate various consonants and vowels. **Consonants:** Sounds like /t/, /d/, /s/, and /z/ require the tongue to make contact with or approach the teeth or the hard palate. **Vowels:** The tongue alters its shape and position within the oral cavity (high, mid, low, front, central, back) to modify the resonance and produce vowel sounds like /i/, /e/, /a/, /o/, and /u/.

Flexibility and Range of Movement: The tongue has intrinsic and extrinsic muscles: Intrinsic muscles control the tongue's shape (e.g., lengthening, shortening, curling). Extrinsic muscles control the tongue's position, moving it forward, backward, upward, and downward. This range of movement allows for the precise articulation required for speech, enabling the production of distinct sounds. **Role in Resonance:** The tongue helps modify the size and shape of the vocal tract, which affects the resonance of the voice. By altering the placement of the tongue, we can change the pitch and tone of sounds. **Coordination with Other Speech Structures:** The tongue works with the lips, teeth, hard and soft palate, and the glottis to produce a full range of speech sounds. For example, the tongue touches the alveolar ridge to create alveolar sounds (like /t/ and /d/), and it can form constrictions with the palate for palatal sounds (like /j/ in "sh"). **Neural Control:** The movement of the tongue is controlled by cranial nerves, primarily the hypoglossal nerve (CN XII), which innervates the muscles of the tongue. Precise control over tongue movements is essential for fluent and clear speech, and any damage to this nerve can affect speech production, leading to conditions like dysarthria. **Speech Disorders Related to Tongue Physiology:** **Ankyloglossia (Tongue-tie):** A condition where the lingual frenulum (the tissue connecting the tongue to the floor of the mouth) is too tight, restricting tongue movement, which can affect speech. **Dysarthria:** A motor speech disorder resulting from weakened or impaired movement of the muscles involved in speech, including the tongue. **Apraxia of Speech:** A neurological condition affecting the motor planning required for speech, where tongue coordination becomes challenging.

The tongue's dynamic interplay with other speech structures and its highly coordinated movements make it an essential organ for articulate and intelligible speech.

The Role of Tongue Position in Vowel Production

Vowels are largely determined by the position of the tongue in the mouth. Linguists traditionally describe vowel sounds by referencing two key dimensions: the vertical (high, mid, low) and horizontal (front, central, back) positioning of the tongue. These axes create a vowel quadrilateral, also known as the vowel space, which is useful for illustrating the range of possible tongue positions during vowel articulation.

1. Vertical Positioning

The vertical position of the tongue refers to how high or low the tongue is in the mouth during speech production. High vowels, such as /i/ (as in "beet") and /u/ (as in "boot"), are produced with the tongue positioned near the roof of the mouth. In contrast, low vowels, such as /æ/ (as in "bat") and /ɑ/ (as in "father"), are articulated

with the tongue lowered toward the base of the mouth. Mid vowels, such as /e/ (as in "bet") and /o/ (as in "boat"), involve a tongue position that is intermediate between high and low vowels.

2. Horizontal Positioning

The horizontal dimension describes how far forward or backward the tongue is placed within the mouth. Front vowels, such as /i/ and /e/, are produced with the tongue pushed toward the front of the mouth, whereas back vowels, such as /u/ and /o/, are articulated with the tongue retracted toward the back of the oral cavity. Central vowels, like /ə/ (schwa), occur when the tongue is in a relatively neutral position within the mouth. Together, these two dimensions—high/low and front/back—capture the broad range of vowel qualities. The position of the tongue influences not only the perceived vowel quality but also the acoustics of the sound. Acoustic studies demonstrate that tongue position alters the resonant frequencies of the vocal tract, known as formants, which are critical for vowel differentiation.

Tongue Position in Consonant Production

Consonant sounds, though often classified based on other articulatory features (such as manner and place of articulation), are also influenced by the position of the tongue. The placement of the tongue can significantly impact the production of both voiced and voiceless consonants.

1. Place of Articulation

For consonants, the position of the tongue in relation to the oral cavity's landmarks (teeth, alveolar ridge, palate) defines the place of articulation. Consonants can be classified based on whether the tongue touches the lips (as in labial consonants), the teeth (as in dental consonants), the alveolar ridge (as in alveolar consonants), or the hard or soft palate (as in palatal and velar consonants). For example, /t/ and /d/ are alveolar sounds, where the tongue tip contacts the alveolar ridge, while /k/ and /g/ are velar sounds, produced with the tongue touching the soft palate (velum).

2. Manner of Articulation

The tongue's shape and positioning are also crucial in the manner of articulation—how airflow is constricted or modified during speech. For example, in producing a fricative like /s/ or /ʃ/, the tongue creates a narrow channel through which air passes, generating friction. Similarly, in plosives like /t/ and /k/, the tongue blocks airflow entirely before releasing it suddenly. The degree of tongue involvement can thus shape the articulation and auditory quality of the consonant.

Linguistic Variation and Tongue Position

The tongue's role in phonetics varies across languages, with different languages utilizing distinct positions of the tongue to produce similar or even identical phonemes. Dialectal variation is also influenced by the tongue's position. For instance, American English and British English may produce the vowel /æ/ differently, with subtle distinctions in the tongue's height and fronting. This variation contributes to the uniqueness of different accents and speech patterns. Moreover, some languages use a wider range of tongue movements, especially in vowel systems. For example, languages like French or Turkish exhibit contrasts between rounded and unrounded vowels, where the position of the tongue and the shape of the lips interact to create different sounds.

Phonological Systems and the Tongue

In phonological theory, the role of the tongue is often modeled through features such as [+high], [+low], [+back], and [+front]. These features help describe the organization of vowel systems in particular languages. In many phonological systems, the tongue's positioning creates a foundation for understanding sound inventories, allophonic variation, and phonotactic rules. For instance, vowel harmony in languages like Hungarian and Turkish is governed by the tongue's positioning, where vowels in a word harmonize based on front-back distinctions. This linguistic phenomenon highlights the importance of tongue position not only in isolated speech sounds but in broader phonological patterns.

Conclusion

The position of the tongue is central to the production and perception of speech sounds. Its movement and placement within the oral cavity shape the sounds of languages, particularly in the articulation of vowels and consonants. The relationship between tongue positioning and phonetics demonstrates the complexity and precision of human speech. Through a combination of physiological adaptability and linguistic constraints, the tongue's position allows for the rich diversity of sounds found across languages. Future research into this area will likely continue to explore how subtle variations in tongue placement contribute to linguistic variation and the evolution of phonetic systems.

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