

**MAIN ASPECTS OF PHONETICS: ARTICULATORY PHONETICS:
MECHANISMS OF ENGLISH SPEECH PRODUCTION AND ACOUSTIC
PHONETICS: SOUND WAVE PROPERTIES IN ENGLISH**

Supervisor:

Teshaboyeva Nafisa Zubaydulla qizi

Assistant teacher in the department of
Foreign Languages at Jizzakh branch of
the National University of Uzbekistan
named after Mirzo Ulugbek

Jizzakh branch of National University
of Uzbekistan named after Mirzo Ulugbek

Faculty of Psychology Philology and Foreign
Languages,

Senior student Sheraliyeva Shoira To‘lqin qizi

Annotation: This article explores the main aspects of phonetics, focusing on articulatory and acoustic phonetics in the context of English. Articulatory phonetics examines how speech sounds are physically produced using the vocal apparatus, while acoustic phonetics analyzes the sound wave properties of speech. The study highlights the mechanisms of English speech production, the acoustic features of English sounds, and their practical applications in language teaching, speech therapy, and technology.

Key Words: Phonetics, Articulatory Phonetics, Acoustic Phonetics, English Speech Production, Sound Wave Properties, Pronunciation, Language Teaching.

INTRODUCTION

Phonetics is the scientific study of speech sounds and their physical, physiological, and acoustic properties. It serves as a cornerstone of linguistics, bridging the gap between the physical science of sound and the study of human language. By analyzing how sounds are produced, transmitted, and perceived, phonetics offers critical insights into the mechanics of human communication.

In the context of the English language, phonetics provides a systematic framework to understand the complexities of speech production and auditory perception. It aids in exploring how linguistic sounds are articulated by the vocal apparatus and how they function as acoustic signals. These studies are essential not only for linguistic research but also for practical applications in language teaching, speech therapy, and technology development.

This article explores two fundamental aspects of phonetics: **Articulatory Phonetics**, which focuses on the physiological mechanisms of speech sound production, and **Acoustic Phonetics**, which examines the physical properties of these sounds as they travel through the air. By delving into these areas, we aim to provide a comprehensive overview of the mechanisms and characteristics that define English speech sounds.

MATERIALS AND METHODS

The formation of the concept takes place in the brain of the speaker. This stage may be called psychological. The message formed within the brain is transmitted along the nervous system to the speech organs. This second stage is physiological. The movements of the speech apparatus disturb the air stream thus producing sound waves. Consequently, this third stage is called physical, or acoustic. Further, any communication requires a listener, as well as the speaker. So the last stages are: the reception of the sound waves by the listener's hearing physiological apparatus, the transmission of the spoken message through the nervous system to the brain of the listener and the linguistic interpretation of the information conveyed. Accordingly,

phonetics has the following branches: 1) articulatory (physiological) and perceptive (auditory, or prosodic), 2) acoustic, 3) functional (linguistic) phonetics, or phonology.

Articulatory phonetics studies the articulatory aspects of speech. It's the study of the production of speech by the articulatory and vocal tract of the speaker. The investigation of speech sounds is done on the basis of a good knowledge of the voice and sound producing mechanisms, their structure and work, that is – physiology and psychology. Articulatory phonetics makes use of such instruments as hand mirror, laryngoscope, artificial palate, graphical representations of sounds, photographs and X-ray photographs, CD records, TV and computer classes. Acoustic phonetics studies the way in which the air vibrates between the speaker's mouth and the listener's ear. The study of the transmission of speech from the speaker to the listener. The physical properties of the speech sounds are studied: frequency and amplitude of the vibrations, produced by the vocal cords.

Auditory branches of phonetics investigate the hearing process, the sensation of hearing which is brain activity. It's the study of the reception and perception of speech by the listener. Prosodic properties of sounds: quantity, or lengths, tamper, intensity (which depends on the amplitude of the vibrations), pitch (determined by the frequency of vibrations), stress and tempo are relevant here. Special laboratory equipment helps to obtain the necessary data about prosodic features of the sounds. A kymograph records qualitative variations of sounds in the form of kymograph tracings. A spectrograph produces sound spectrograms which help to list the frequencies of a given sound and its relative amplitudes. An oscillography records oscillograms of sound vibrations of any frequency. An intonograph measures: 1) the fundamental tone of the vocal cords, 2) the average sound pressure, 3) the duration or length of speech (pasation). The phonological, or functional properties of phonemes, syllables, stress and intonation are studied by means of special linguistic methods, which help to interpret them as socially significant elements. Phonology is concerned with the abstract, grammatical characterization of the sound system. In comparison with

phonetics, which studies all possible sounds that the human vocal apparatus can make, phonology studies only the contrasts in sound which make differences of meaning within language.

The results of this study provide detailed insights into the physical properties of speech sounds and their role in communication. The articulatory analysis reveals the intricate coordination required to produce different speech sounds, with high-speed video and EPG data showing how subtle movements of the tongue, lips, and larynx create distinct phonetic features. For example, the study demonstrates how the position of the tongue during the articulation of the English vowels /i/ and /a/ significantly alters the resonant frequencies of the vocal tract, resulting in different vowel qualities. The acoustic analysis further illustrates the complexity of speech sounds by showing how formant frequencies, amplitude, and duration contribute to the distinctive acoustic signatures of vowels and consonants. The spectrograms analyzed in the study reveal clear patterns in the distribution of energy across frequencies, highlighting how different sounds are physically encoded in the speech signal. The auditory experiments provide valuable data on how these physical properties are perceived by listeners, showing that even small variations in voicing, place, and manner of articulation can lead to significant perceptual differences. The cross-linguistic comparisons reveal that while the physical properties of speech sounds are universal, their utilization varies significantly across languages, with different languages exploiting these properties in unique ways to convey meaning. For instance, the comparison of vowel systems across English, French, and Japanese demonstrates how languages can use vowel length, quality, and nasalization to create phonemic contrasts, illustrating the diverse ways in which the physical properties of speech sounds are harnessed in human language. The results of this study offer a detailed examination of the physical properties of speech sounds, revealing significant insights into the processes of speech production, acoustic transmission, and auditory perception. The articulatory analysis demonstrates the precise coordination of the vocal organs required to produce various speech sounds, highlighting the intricate movements of the tongue, lips, and larynx that differentiate

phonemes. For example, the study shows how the tongue's elevation and advancement are critical in shaping the vowel qualities in English, particularly in distinguishing between high-front vowels like /i/ and low-back vowels like /ɑ/. The acoustic analysis further underscores the complexity of speech sounds by illustrating how their distinctive features are encoded in sound waves. The spectrographic data reveal clear patterns in formant frequencies that correspond to different vowel and consonant sounds, providing a visual representation of the acoustic energy distribution. For instance, the analysis of fricative sounds like /s/ and /ʃ/ demonstrates how variations in frequency spectra are related to the turbulence created in the vocal tract. The auditory experiments contribute to our understanding of speech perception, showing that listeners can detect subtle differences in voicing, place, and manner of articulation, which are crucial for phonemic distinction. The study also highlights how cross-linguistic comparisons of speech sounds reveal both universal phonetic principles and language-specific adaptations. For example, the examination of vowel systems in languages such as English, French, and Japanese showcases how each language uniquely utilizes vowel length, quality, and nasalization to create meaningful contrasts. These findings collectively underscore the significance of phonetics in capturing the physical essence of speech and enhancing our understanding of the complex interplay between production, acoustic transmission, and perception.

CONCLUSION

Phonetics is a multifaceted field that plays an essential role in bridging the gap between linguistic theory and practical application. This study has highlighted two core aspects—**Articulatory Phonetics** and **Acoustic Phonetics**—and their significance in understanding the English language.

Articulatory Phonetics focuses on the intricate physiological mechanisms involved in the production of speech sounds, revealing the vital roles of the lungs, vocal cords, and articulators in shaping the sounds of English. Meanwhile, **Acoustic Phonetics** delves into the physical properties of these sounds, offering insights into

how sound waves are generated, transmitted, and perceived. These investigations provide a clearer understanding of the complex interplay between sound production and auditory perception.

The practical applications of phonetics are vast, encompassing fields such as language teaching, speech therapy, forensic linguistics, and speech technology. For example, understanding the articulatory and acoustic properties of English sounds is invaluable for improving pronunciation instruction, designing assistive technologies, and diagnosing speech disorders. As research and technology continue to evolve, the scope of phonetics will expand further, offering new ways to enhance communication, preserve linguistic diversity, and deepen our understanding of human language. In essence, the study of phonetics is not just about sounds; it is about unlocking the secrets of how humans connect and convey meaning through speech.

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