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THREE FUNDAMENTAL ASPECTS OF SPEECH SOUNDS

Jizzakh branch of the National

University of Uzbekistan named after Mirzo Ulugbek

The faculty of Psychology, department of Foreign languages

Phylology and foreign languages

Scientific adviser: Teshaboyeva Nafisa Zubaydulla qizi

Student of group 301-21: Abdug`aniyeva E'zoza Zafarjon qizi

Annotation: This article provides an in-depth examination of the three primary properties that define speech sounds in the field of phonetics: articulatory, acoustic, and auditory. It begins by explaining the articulatory aspect, which focuses on the physical production of sounds through the movement and positioning of the vocal organs. Next, it explores the acoustic properties, detailing how sounds travel as sound waves characterized by frequency, amplitude, and formants. Finally, the article covers the auditory properties, explaining how sounds are perceived and processed by the human ear and brain, influencing how listeners interpret pitch, loudness, and distinctions between sounds. Each property is broken down into its key components, offering a clear understanding of how these factors work together to facilitate human communication. By presenting these threefold properties, the article emphasizes the complexity of speech sounds and highlights their importance in linguistics, speech technology, and cognitive science. The structured overview provides valuable insights for anyone interested in the mechanics and perception of language.

Key words: Speech sounds, phonetics, articulatory properties, acoustic properties, auditory properties, vocal apparatus, vocal folds, place of articulation, manner of articulation, sound waves, frequency, amplitude, formants, pitch perception, loudness perception, speech sound discrimination, linguistics, communication, language processing.

Speech sounds, the foundation of human language, are produced through complex physiological processes and analyzed for their distinctive properties. These sounds enable communication and expression across cultures and languages. In phonetics, the study of speech sounds, linguists often examine them through three essential properties: articulatory, acoustic, and auditory. These threefold properties provide a comprehensive framework to

understand how sounds are created, transmitted, and perceived in human communication. Let's explore each property in detail.

Articulatory Properties

The articulatory aspect of speech sounds focuses on how sounds are produced by various parts of the human vocal apparatus. The study of articulation examines the roles of the vocal cords, tongue, lips, teeth, and other structures involved in shaping speech sounds.

- Vocal Folds: The vocal folds (or vocal cords) play a central role in producing voiced and voiceless sounds. Voiced sounds, like /b/ and /d/, occur when the vocal cords vibrate, while voiceless sounds, like /p/ and /t/, occur without this vibration.

- Place of Articulation: This refers to the specific area in the vocal tract where constriction occurs to shape sound. For example, sounds like /p/ and /b/ are called bilabial sounds because they are formed with both lips, while /k/ and /g/ are velar sounds formed at the back of the mouth.

- Manner of Articulation: This describes how airflow is modified in the vocal tract. Stops (like /p/ and /t/) involve a complete stoppage of airflow, while fricatives (like /f/ and /s/) involve a partial obstruction, creating a frictional sound.

Through understanding articulatory properties, linguists can categorize and describe sounds across languages, creating a system for how they are produced physically in human speech.

Acoustic Properties

The acoustic properties focus on how sounds travel through the air as sound waves. This aspect of speech sounds is essential for understanding the physics of sound, including frequency, amplitude, and duration. Frequency is the number of vibrations per second, measured in Hertz (Hz), and it determines the pitch of a sound. High-frequency sounds, like /s/, are perceived as higher-pitched, while low-frequency sounds, like /m/, are lower-pitched. Amplitude refers to the energy or loudness of a sound. Louder sounds have higher amplitudes, while softer sounds have lower amplitudes. Formants are resonant frequencies created by the shape of the vocal tract during speech. These frequencies are crucial for distinguishing vowel sounds. Each vowel has a unique pattern of formants, particularly the first two, F1 and F2, which allow listeners to differentiate sounds like /a/ and /i/.

Acoustic properties enable researchers to analyze speech with specialized equipment like spectrograms, which visually display the sound's frequency and amplitude over time. This analysis helps in understanding the nuances of sound transmission and aids in applications like speech recognition and synthesis.

Auditory Properties

The auditory properties of speech sounds focus on how sounds are perceived by the human ear and processed by the brain. This field of study is critical for understanding the listener's experience and interpretation of speech. As discussed in acoustic properties, pitch is determined by frequency. The human ear can detect subtle changes in pitch, which can be crucial for understanding tonal languages, like Mandarin Chinese, where pitch variation can change word meaning. While amplitude measures the physical intensity of sound, loudness is the subjective perception of that intensity. Sounds with greater amplitude are generally perceived as louder, but perception can be influenced by factors like background noise and the sound's frequency range.

The auditory property allows listeners to distinguish between phonemes, the smallest units of sound that change meaning in a language. For example, the sounds /p/ and /b/ in English are distinct phonemes, and being able to perceive the difference is essential for understanding language. Understanding auditory properties is key in fields like audiology, language acquisition, and psycholinguistics, where perception of speech sounds plays a central role in communication.

Conclusion

The threefold properties of speech sounds – articulatory, acoustic, and auditory – create a holistic view of how sounds are produced, transmitted, and perceived. Each property offers unique insights that contribute to linguistics, cognitive science, and speech technology. By examining these properties, researchers not only deepen their understanding of human language but also develop tools and technologies that bridge gaps in communication, from speech recognition to hearing aids. This framework underscores the richness of human language and the intricate processes involved in transforming thoughts into audible expressions.

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