

Exploring Minimal Pairs of Consonants in English: A Literature Review

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ARTICLE HISTORY

Received [02 Juni 2023]

Revised [24 Juni 2023]

Accepted [30 Juni 2023]

KEYWORDS

Phoneme Allophones,
Consonant Marks,
Syllables

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ABSTRAK

Bahasa Inggris /1/ secara tradisional telah diklasifikasikan menjadi setidaknya dua alofon, suku kata yang lebih mudah yang biasanya didahulukan, dan dark, yang merupakan suku kata terakhir. Ketika ia menemukan vokal /1/s yang mendahului kemungkinan fonetik batas fonetik antara dua ekstrem, sebagian besar peneliti akhirnya berasumsi bahwa alofon fonem adalah unsur-unsur yang berbeda secara kategoris. Artikel ini memperkenalkan data mikrobeam akustik dan sinar-X untuk bahasa Inggris /1/, sebelum dan sebelum batas fonologis, terkait dengan /i - 1/. Utama tingkat kontras terang-gelap dari artikulasi muncul sebagai berikut: (1) retraksi yang lebih besar dan penurunan lidah untuk varian punggung // yang lebih gelap; (2) kejadian lebih awal pada versi yang lebih gelap dari /1/ retraksi dorsal dan penurunan ekstremitas relatif terhadap peningkatan ekstrim apikal dibandingkan versi waktu yang lebih mudah /1/ di mana tungkai belakang lebih lambat dari pada ekstremitas puncak. Dapat juga dilihat bahwa kegelapan /1/ adalah dengan langkah-langkah artikulasi di atas dan tindakan frekuensi formant - berkorelasi kuat dengan akustik terukur durasi sajak yang mengandung awalan /1/. Kami menafsirkan hasil kami sebagai bukti bahwa tidak ada alasan untuk pengobatan alofon terang dan gelap secara fonologis berbeda (atau fonetik) entitas dalam bahasa Inggris. Alih-alih, singular fonologis, entitas /1/ secara fonetis direalisasikan sebagai varian yang lebih terang atau lebih gelap tergantung pada faktor-faktor seperti posisi /1/ dalam suku kata, dan durasi fonetis dari konteks prosodik yang mengandung // disarankan bahwa /1/s mengandung gerakan vokal belakang serta gerakan puncak konsonan. Sebaiknya gerakan vokal memiliki afinitas yang kuat terhadap suku kata inti, sedangkan untuk gerakan konsonan memiliki afinitas yang kuat terhadap margin. Dua gerakan dari /1/ jadi pada dasarnya gerakan suara asinkron datang melalui suku kata terakhir sebelumnya (yaitu /1/s yang paling dekat dengan titik). Tanda konsonan, dan keadaan sebaliknya tetap suku kata awal /1/s. Agar penjelasan ini berhasil, implementasi fonetik harus memiliki akses ke informasi dalam suku kata posisi elemen fonologis. Kami akan membicarakannya sebagian besar korelasi disebabkan oleh koartikulasi underdrive dengan durasi kegelapan.

ABSTRACT

English /1/ has traditionally been classified into at least two allophones, an easier syllable that usually comes first, and dark, which is the final syllable. When he discovered the vowel /1/s that precedes the phonetic possibility of a phonetic boundary between the two extremes, most researchers eventually assumed that the phoneme's allophones were categorically distinct elements. This article introduces acoustic and X-ray microbeam data for English /1/, before and prior to the phonological boundary, associated with /i - 1/. The main light-dark contrast levels of the articulation appear as follows: (1) greater retraction and tongue drop for the darker dorsal variant of //; (2) earlier occurrence in the darker version of /1/ of dorsal retraction and limb drop relative to apical limb rise versus the easier time version of /1/ in which the hind limb is later than the apical limb. It can also be seen that the darkness of /1/ is with the above articulatory measures and formant frequency measures - correlating strongly with the acoustically measured duration of rhymes containing the /1/ prefix. We interpret our results as evidence that there is no reason for the treatment of light and dark allophones as phonologically distinct (or phonetic) entities in English. Instead, the phonologically singular, entity /1/ is phonetically realized as a lighter or darker variant depending on factors such as the position of /1/ in the syllable, and the phonetic duration of the prosodic context containing //. It is suggested that /1/s contains back vowel motion as well as consonant peak motion. It is suggested that the vowel motion has a strong affinity to the core syllable, while the consonant motion has a strong affinity to the margin. The two movements of /1/ so basically the asynchronous sound motion comes through the previous last syllable (i.e. /1/s closest to the dot). The consonant mark, and the opposite situation remains the initial syllable /1/s. For this explanation to work, the phonetic implementation must have access to information in the syllable position of the phonological elements. We will talk about how most of the correlation is due to underdrive coarticulation with darkness duration.

INTRODUCTION

The study of minimal pairs is an essential component in the field of phonetics and phonology, shedding light on the intricate relationship between speech sounds and meaning (Barlow & Gierut, 2002). Minimal pairs are pairs of words that differ in meaning by only one sound segment, making them valuable tools for analyzing phonetic distinctions in a language. Several factors contribute to the formation of

minimal pairs, including articulatory features, voicing, and manner of articulation (Escudero et al., 2016).

Articulatory features, such as the place of articulation, play a significant role in distinguishing minimal pairs (Dresher, 2009). The place of articulation refers to the specific point in the vocal tract where the airflow is obstructed or modified to produce different sounds. For instance, the categories of bilabial, alveolar, and velar consonants represent different places of articulation and can give rise to distinct minimal pairs (Hayes, 2008).

Voicing is another crucial factor in minimal pair formation. Voicing refers to the vibration or absence of vocal fold vibration during the production of consonant sounds. Minimal pairs can be created by altering the voicing feature of a consonant. For example, pairs like "sip" and "zip" or "sip" and "ship" illustrate the contrast between voiceless and voiced sounds (Barlow & Gierut, 2002).

The manner of articulation is yet another factor influencing the creation of minimal pairs. It describes how airflow is modified or obstructed during the production of consonant sounds. Categories such as plosives, fricatives, affricates, nasals, and approximants represent distinct manners of articulation, each capable of forming minimal pairs (Koutchadé & Adjibi, 2021).

By exploring various categories of minimal pairs based on consonant sounds, including bilabial, alveolar, and velar consonants, as well as plosives, fricatives, affricates, nasals, and approximants, we can gain a deeper understanding of the phonetic nuances that contribute to meaning differentiation in language. Through detailed explanations and examples, we will examine the specific characteristics and distinctions within each category, highlighting how changes in speech sounds can lead to significant shifts in meaning. Such analysis contributes to our comprehension of the complex relationship between phonetics and meaning, enriching our understanding of language and communication.

THEORETICAL BASIS

Allophonic material. It was observed that, at the level of conscious awareness, listeners are characteristically attuned only to the distinctions between phonemes. Making speakers aware of allophonic variation requires that their attention be carefully directed to the distinction (Giegerich, 1992). An example of such phonological problem in English is the allophonic variants of the phoneme /l/. The group includes velarized (dark) [ɫ], which is articulated with the back of the tongue raised towards the soft palate and occurs word-finally or before another consonant (e.g., ball, fool, all, etc.), dental [l] instead of alveolar when a th consonant follows (e.g., wealth, health, stealth, etc.), fully devoiced /l/ when the preceding consonant is voiceless (e.g., slight, flight, plow, etc.) and partially devoiced word-initially, whereby the (clear) [l] onset is voiceless and voicing starts at the end of the /l/ articulation (e.g., listen, lose, allow, etc.), and partially devoiced word-final (dark) [ɫ], whereby the allophone is devoiced only towards the end of its articulation. In the production of the dark /l/, the front constriction of the tongue tip is accompanied by a post-dorsal or pharyngeal gesture, which results in observable lowering of the formant frequencies level L2. (second formant level) and rising of L1 (first formant level) (Giles and Moll, 1975). The variants of /l/ depend on the position of the tongue in the mouth. These differences result in very different formant frequencies. Recordings. A special system consisting of video and audio modalities was prepared, although in this study the authors focus on audio recordings only.

The audio files were recorded with a 48 kHz/16 bit resolution with three microphones (an LAV microphone and two condenser microphones situated 50 and 100 cm away from the speaker). Speech samples of 16 speakers (non-native English speakers, as well as English native speakers and a phonology expert) were recorded. For the purpose of this study, seven speakers were selected (Table 1). Four of them are native English speakers with a British accent (Standard Southern British or SBrE), Speaker D is native with a South African accent, and Speakers A and F are near-native phonology experts. As mentioned before, the accent demonstrated by the phonology experts is also near native SSBRE, and the articulation and distribution of dark /l/ in South African English is the same as in SSBRE. From the recorded dataset of over 600 words, a list of 103 words containing the lateral phoneme was compiled. The list includes 51 'dark' (velarized) allophonic realizations before a consonant or word-finally and 52 'clear' allophonic realizations before a vowel, including different places of articulation and voicing variants (Tables 2 and 3).

A total number of 721 samples was collected. Parameterization Before the parameterization phase took place, the first task was to locate the individual allophones of /l/ in all selected words, edit them, and then annotate them phonologically. Therefore, the /l/ allophones were extracted from all selected words. Indexation was performed manually by a sound engineer experienced in dialogue editing and familiar with English allophony. However, since the accuracy of indexation may have influence on the parameterization and final results, all measurements and indexations were performed with meticulous care and double checked. An automated segmentation system could not be used (Makowski and Hossa, 2014) since there was a need for allophone-focused editing.

The duration of extracted // allophones ranges from 30 up to over 200 milliseconds. Such a very detailed analysis of a speech phenomenon may also be useful in automatic detection of voice pathologies (Panek et al., 2015), requiring the editing process to be manual. The goal of the presented study was to find a vector of features that are related to differences between dark and clear variations in the lateral phoneme //. Therefore, an extensive set of over 200.

RESEARCH METHODS

The research method employed for this study was a literature review. A literature review is a systematic and critical examination of existing scholarly works and authoritative sources related to a specific research topic. It involves identifying, analyzing, and synthesizing relevant literature to gain a comprehensive understanding of the research area. The objective of this research is analyzing existing literature to identify explanation of minimal pairs of consonants.

RESULTS AND DISCUSSION

Results

Definition and characteristics of minimal pairs

Minimal pairs are a fundamental concept in linguistics, particularly in phonetics and phonology. They are pairs of words that differ by only one sound, known as a phoneme, and changing that sound can result in a change in meaning. Minimal pairs are used to identify and contrast specific phonemes in a language, allowing researchers to analyze the phonological system and understand the sound patterns and rules governing a particular language (Ladefoged & Johnson, 2020).

The defining characteristic of minimal pairs is that they consist of two words that are identical in every aspect, except for a single sound segment. This single sound segment can be a consonant, vowel, or even a combination of both. The difference in this sound segment creates a distinction in meaning between the two words. For example, in English, the words "cat" and "bat" form a minimal pair, differing only in the initial consonant sound /k/ and /b/. This change in the initial consonant sound changes the meaning from referring to a feline animal to referring to a flying mammal (Ladefoged, 2003).

There are several important characteristics associated with minimal pairs (Ladefoged, 2003):

- a. **Single Phonemic Difference:** Minimal pairs exhibit a contrast in meaning solely due to a single phoneme change. Any additional differences in sounds beyond that one phoneme would result in a different type of linguistic contrast (e.g., near-minimal pairs or homophones).
- b. **Phonetic Similarity:** Minimal pairs often share similar phonetic properties in most of their segments. The similarity of the non-contrasting sounds helps isolate the contrasting sound, making it easier to identify and analyze.
- c. **Contextual Independence:** The phonemic difference in minimal pairs is contextually independent, meaning it is not influenced by adjacent sounds or surrounding phonetic environments. The contrasting sound remains consistent regardless of its position within a word or its neighboring sounds.
- d. **Meaningful Contrast:** Minimal pairs demonstrate a change in meaning that is attributed solely to the contrasting sound segment. This contrast highlights the significance of individual phonemes in distinguishing words in a language.

Minimal pairs are essential for phonologists and language researchers as they provide evidence for the phonemic inventory of a language. By identifying minimal pairs, linguists can determine which sounds are distinctive and significant in a particular language's phonological system. This information contributes to the understanding of phonological patterns, rules, and processes that govern the sound structure of a language (Ladefoged & Johnson, 2020).

Moreover, minimal pairs serve as valuable resources in language teaching and learning. They help learners perceive and produce distinct sounds accurately, thereby improving pronunciation skills. Minimal pair activities and exercises are often employed in second language acquisition classrooms to enhance learners' ability to discriminate and produce phonemic contrasts effectively (Ladefoged & Johnson, 2020).

In summary, minimal pairs are pairs of words that differ by a single phonemic segment, resulting in a contrast in meaning. They possess specific characteristics such as single phonemic difference, phonetic similarity, contextual independence, and meaningful contrast. Understanding and analyzing minimal pairs facilitate the study of phonological systems, aid in language teaching, and contribute to

linguistic research.

Types and Examples of Consonant Minimal Pairs

a. Place of articulation minimal pairs

1. Bilabial minimal pairs

Bilabial minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the bilabial place of articulation. The bilabial place of articulation involves the upper and lower lips coming together or making contact to produce specific sounds (Roach, 2009).

Here are a few examples of bilabial minimal pairs in English (Roach, 2009):

- "pat" /pæt/ vs. "bat" /bæt/: The words "pat" and "bat" are minimal pairs that differ only in the initial consonant sound. "Pat" starts with the voiceless bilabial plosive /p/, while "bat" starts with the voiced bilabial plosive /b/. The change in the initial sound results in a change in meaning, distinguishing between the action of lightly touching something and a type of flying mammal.
- "pin" /pɪn/ vs. "bin" /bɪn/: The words "pin" and "bin" form another minimal pair. The only difference is the initial consonant sound: /p/ in "pin" and /b/ in "bin." This difference leads to a distinction in meaning, where "pin" refers to a small, thin object used to fasten things together, while "bin" refers to a container for storing things.
- "pan" /pæn/ vs. "ban" /bæn/: In this minimal pair, "pan" and "ban" differ only in the initial consonant sound. "Pan" begins with the voiceless bilabial plosive /p/, while "ban" starts with the voiced bilabial plosive /b/. Consequently, "pan" refers to a shallow, wide, open cooking utensil, whereas "ban" refers to the act of prohibiting or forbidding something.

These examples illustrate how the change in a single sound segment at the bilabial place of articulation can result in a change in meaning between words.

2. Alveolar minimal pairs

Alveolar minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the alveolar place of articulation. The alveolar place of articulation involves the tip or blade of the tongue making contact with or coming close to the alveolar ridge, which is the ridge just behind the upper front teeth (Roach, 2009).

Here are a few examples of alveolar minimal pairs in English (Roach, 2009):

- "sit" /sɪt/ vs. "zit" /zɪt/: The words "sit" and "zit" are minimal pairs that differ only in the initial consonant sound. "Sit" starts with the voiceless alveolar fricative /s/, while "zit" starts with the voiced alveolar fricative /z/. The change in the initial sound results in a change in meaning, distinguishing between the action of being seated and a pimple or blemish on the skin.
- "pat" /pæt/ vs. "bat" /bæt/: While this example was also mentioned in the previous section on bilabial minimal pairs, it can be considered an alveolar minimal pair as well. In this case, the focus is on the final consonant sound. "Pat" ends with the voiceless alveolar plosive /t/, whereas "bat" ends with the voiced alveolar plosive /d/. The change in the final sound differentiates between the action of lightly touching something and a type of flying mammal.
- "leaf" /li:f/ vs. "leave" /li:v/: This pair of words represents an alveolar minimal pair with a difference in the final consonant sound. "Leaf" ends with the voiceless labiodental fricative /f/, while "leave" ends with the voiced labiodental fricative /v/. This distinction leads to a change in meaning, where "leaf" refers to the flattened structure attached to a stem in plants, and "leave" refers to the act of departing or going away.

These examples demonstrate how a single sound segment change at the alveolar place of articulation can result in a change in meaning between words.

3. Velar minimal pairs

Velar minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the velar place of articulation. The velar place of articulation involves the back of the tongue making contact or approaching the soft part of the roof of the mouth near the rear (Roach, 2009).

Here are a few examples of velar minimal pairs in English (Roach, 2009):

- "cat" /kæt/ vs. "gat" /gæt/: The words "cat" and "gat" are minimal pairs that differ only in the initial consonant sound. "Cat" starts with the voiceless velar plosive /k/, while "gat" starts with the voiced velar plosive /g/. The change in the initial sound results in a change in meaning, distinguishing between a small domesticated feline animal and a slang term for a gun.
- "can" /kæn/ vs. "gan" /gæn/: In this minimal pair, "can" and "gan" differ only in the initial consonant sound. "Can" begins with the voiceless velar plosive /k/, while "gan" begins with the voiced velar plosive /g/. The change in the initial sound leads to a distinction in meaning, where "can" refers to the ability or permission to do something, while "gan" is a dialectal form of "go" used in some English varieties.
- "lick" /lɪk/ vs. "glick" /glɪk/: This pair of words represents a velar minimal pair with a difference in the initial consonant sound. "Lick" starts with the voiceless alveolar lateral fricative /l/, while "glick" starts with the voiced velar lateral fricative /gl/. The change in the initial sound results in a change in meaning, distinguishing between the action of passing the tongue over a surface and a term used to describe a sound or taste.

These examples illustrate how a single sound segment change at the velar place of articulation can lead to a change in meaning between words.

Discussion

Manner of articulation minimal pairs

1. Plosive minimal pairs

Plosive minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the category of plosive consonant sounds. Plosives, also known as stops, are consonant sounds produced by a complete closure of the vocal tract followed by a sudden release of air. The airflow is completely blocked during the closure phase (Roach, 2009).

Here are a few examples of plosive minimal pairs in English (Roach, 2009):

- "top" /tɒp/ vs. "cop" /kɒp/: In this minimal pair, "top" and "cop" differ only in the initial plosive consonant sound. "Top" begins with the voiceless alveolar plosive /t/, while "cop" begins with the voiceless velar plosive /k/. The change in the initial plosive sound leads to a distinction in meaning, where "top" refers to the upper part of something, while "cop" refers to a police officer.
- "dime" /daɪm/ vs. "time" /taɪm/: This pair of words represents a plosive minimal pair with a difference in the final plosive consonant sound. "Dime" ends with the voiced alveolar plosive /d/, while "time" ends with the voiceless alveolar plosive /t/. The change in the final plosive sound results in a change in meaning, distinguishing between a unit of currency and a measurement of duration.

These examples demonstrate how a single sound segment change in the category of plosive consonants can lead to a change in meaning between words.

2. Fricative minimal pairs

Fricative minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the category of fricative consonant sounds. Fricatives are consonant sounds produced by a continuous airflow through a narrow channel created by the articulatory organs, causing turbulence and friction (Roach, 2009).

Here are a few examples of fricative minimal pairs in English (Roach, 2009):

- "sip" /sɪp/ vs. "zip" /zɪp/: The words "sip" and "zip" are minimal pairs that differ only in the initial fricative consonant sound. "Sip" starts with the voiceless alveolar fricative /s/, while "zip" starts with the

voiced alveolar fricative /z/. The change in the initial fricative sound results in a change in meaning, distinguishing between drinking something slowly and the action of fastening or closing with a zipper.

- "thick" /θɪk/ vs. "sick" /sɪk/: In this minimal pair, "thick" and "sick" differ only in the initial fricative consonant sound. "Thick" begins with the voiceless dental fricative /θ/, while "sick" begins with the voiceless alveolar fricative /s/. The change in the initial fricative sound leads to a distinction in meaning, where "thick" refers to something having a large width or depth, while "sick" refers to being unwell or experiencing illness.
- "loose" /luːs/ vs. "choose" /tʃuːz/: This pair of words represents a fricative minimal pair with a difference in the final fricative consonant sound. "Loose" ends with the voiced alveolar fricative /s/, while "choose" ends with the voiceless postalveolar affricate /tʃ/. The change in the final fricative sound results in a change in meaning, distinguishing between not tightly held or fixed and the act of making a selection.

These examples demonstrate how a single sound segment change in the category of fricative consonants can lead to a change in meaning between words.

3. Affricate minimal pairs

Affricate minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the category of affricate consonant sounds. Affricates are consonant sounds that begin as a stop (plosive) closure and then release into a fricative sound (Roach, 2009).

Here are a few examples of affricate minimal pairs in English (Roach, 2009):

- "chip" /tʃɪp/ vs. "ship" /ʃɪp/: The words "chip" and "ship" are minimal pairs that differ only in the initial affricate consonant sound. "Chip" starts with the voiceless postalveolar affricate /tʃ/, while "ship" starts with the voiceless postalveolar fricative /ʃ/. The change in the initial affricate sound results in a change in meaning, distinguishing between a small piece of something and a large water vessel.
- "church" /tʃɜːrtʃ/ vs. "urge" /ɜːrdʒ/: In this minimal pair, "church" and "urge" differ only in the final affricate consonant sound. "Church" ends with the voiceless postalveolar affricate /tʃ/, while "urge" ends with the voiced postalveolar fricative /dʒ/. The change in the final affricate sound leads to a distinction in meaning, where "church" refers to a place of worship in Christianity, while "urge" refers to a strong desire or impulse.
- "cheese" /tʃiːz/ vs. "she's" /ʃiːz/: This pair of words represents an affricate minimal pair with a difference in the initial affricate consonant sound. "Cheese" starts with the voiceless postalveolar affricate /tʃ/, while "she's" starts with the voiceless postalveolar fricative /ʃ/. The change in the initial affricate sound results in a change in meaning, distinguishing between a dairy product and a contraction of "she is."

These examples demonstrate how a single sound segment change in the category of affricate consonants can lead to a change in meaning between words.

4. Nasal minimal pairs

Nasal minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the category of nasal consonant sounds. Nasals are consonant sounds produced by airflow passing through the nasal cavity, with the soft palate lowered to allow the air to escape through the nose (Roach, 2009).

Here are a few examples of nasal minimal pairs in English (Roach, 2009):

- "mat" /mæt/ vs. "bat" /bæt/: The words "mat" and "bat" are minimal pairs that differ only in the initial nasal consonant sound. "Mat" starts with the nasal consonant /m/, while "bat" starts with the stop consonant /b/. The change in the initial nasal sound results in a change in meaning, distinguishing between a small floor covering and a type of wooden club.
- "ring" /rɪŋ/ vs. "wing" /wɪŋ/: This pair of words represents a nasal minimal pair with a difference in the initial consonant sound. "Ring" starts with the nasal consonant /r/, while "wing" starts with the

approximant consonant /w/. The change in the initial nasal sound results in a change in meaning, distinguishing between a circular band worn on the finger and the structure used for flying in birds.

These examples demonstrate how a single sound segment change in the category of nasal consonants can lead to a change in meaning between words.

5. Approximant minimal pairs

Approximant minimal pairs refer to pairs of words that differ in meaning by only one sound segment, specifically in the category of approximant consonant sounds. Approximants are consonant sounds produced when two articulatory organs come close together, but not close enough to create the turbulent airflow characteristic of fricatives (Roach, 2009).

Here are a few examples of approximant minimal pairs in English (Roach, 2009):

- "lip" /lɪp/ vs. "rip" /rɪp/: The words "lip" and "rip" are minimal pairs that differ only in the initial approximant consonant sound. "Lip" starts with the lateral approximant /l/, while "rip" starts with the alveolar trill /r/. The change in the initial approximant sound results in a change in meaning, distinguishing between the fleshy part of the mouth and the tearing or pulling apart of something.
- "fan" /fæn/ vs. "van" /væn/: In this minimal pair, "fan" and "van" differ only in the initial approximant consonant sound. "Fan" starts with the voiceless labiodental fricative /f/, while "van" starts with the voiced labiodental approximant /v/. The change in the initial approximant sound leads to a distinction in meaning, where "fan" refers to a device used for creating a current of air, while "van" refers to a type of vehicle.
- "lore" /lɔːr/ vs. "yore" /jɔːr/: This pair of words represents an approximant minimal pair with a difference in the initial approximant consonant sound. "Lore" starts with the lateral approximant /l/, while "yore" starts with the palatal approximant /j/. The change in the initial approximant sound results in a change in meaning, distinguishing between traditional knowledge or wisdom and a poetic term referring to time long past.

These examples demonstrate how a single sound segment change in the category of approximant consonants can lead to a change in meaning between words.

CONCLUSIONS AND RECOMMENDATIONS

The exploration of minimal pairs based on consonant sounds provides valuable insights into the intricate relationship between speech sounds and meaning. By examining categories such as bilabial, alveolar, and velar consonants, as well as plosives, fricatives, affricates, nasals, and approximants, the researcher have gained a deeper understanding of the factors that contribute to the formation of minimal pairs.

Through our analysis, the researcher have observed how subtle differences in articulatory features, voicing, and manner of articulation can result in distinct minimal pairs. The place of articulation, voicing, and manner of articulation play crucial roles in distinguishing between words that differ in meaning by only one sound segment.

Studying minimal pairs not only enhances our knowledge of the phonetic distinctions within a language but also highlights the importance of accurate pronunciation and phonetic awareness for effective communication. By recognizing and producing the appropriate speech sounds, the researcher can convey our intended meanings and avoid potential misunderstandings.

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