TONAL ANALYSIS OF MANKIYALI: AN ACOUSTIC STUDY

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Original Article

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Abstract

Mankiyali is an Indo-Aryan language spoken in remote hilly areas by a small community in northern Pakistan. It is an undocumented language and is in immediate need of research from a linguistic viewpoint. The purpose of the present study is to investigate the tone of Mankiyali. For that to achieve, an audio file was generated that contained various utterances of the native speakers. Thefile contained three sets which were recorded from three speakers. Each set had three words that carried different meanings in the given three sets. The set list was distributed among the selected participants, who were instructed to utter these words ata natural-normal speed rate. They first uttered the words with meaning and then without meaning. The utterances of all three speakers were recorded usinga high-quality ZoomH6 recorder and saved ona laptop. To obtain the intended objectives of the study, the recorded data were analysed through Praat. There were three data sets; only one speaker was randomly selected for a single set, and the collected utterances were then analysed. Similarly, another speaker was chosen for another set, and so on. The results were obtained through acoustics analysis using Praat, and the spectrograms were taken of every word with various pitches, respectively. The results revealed that there were rising, falling, rising-falling tones in the utterances of the native speakers. Thus, it was concluded that Mankiyali has a three-way contrastive and lexical contour tone.

Keywords: Mankiyali, pitch, tone, lexical words, acoustic analysis.

Introduction

Mankiyali is an Indo-Aryan language spoken by a small community. It is an endangered language practised in the hilly areas of Khyber Pakhtunkhwa, Pakistan (Ullah, Hussain, & Anjum, 2020). It is known by the term Tarawara in legal/*patwari* documents, but the term Mankiyali is famously used among its speakers (Anjum, 2016). It belongs to the Indo-Aryan family (see Figure 1). The languagesbelonging to the Dardic group are mainly spoken in the hilly areas (Radloff, 1999).

The main objectives of the current study are to investigate the tone of Mankiyali acoustically using Praat software and take the spectrograms for precise physical properties of the exiting pitch, which distinguishes the meaning of lexical words

Classification of Mankiyali Language

Languages are classified according to their families based on phonological and morphological categories.Mankiyaliis an Indo-Aryan language. Its relation is shown with other languages in Figure 1, which connects it to the neighbouring and sister languages. Mankiyali itself and its sister languages

are practised in mountainous areas. Masica (1991) states that IA languages belong to the Indo-European family. This group of languages is spoken in various countries, e.g., Bangladesh, India, Pakistan, Maldives Islands, Nepal, and Sri Lanka. He also claims that these languages have rich literature which remained undiscovered.

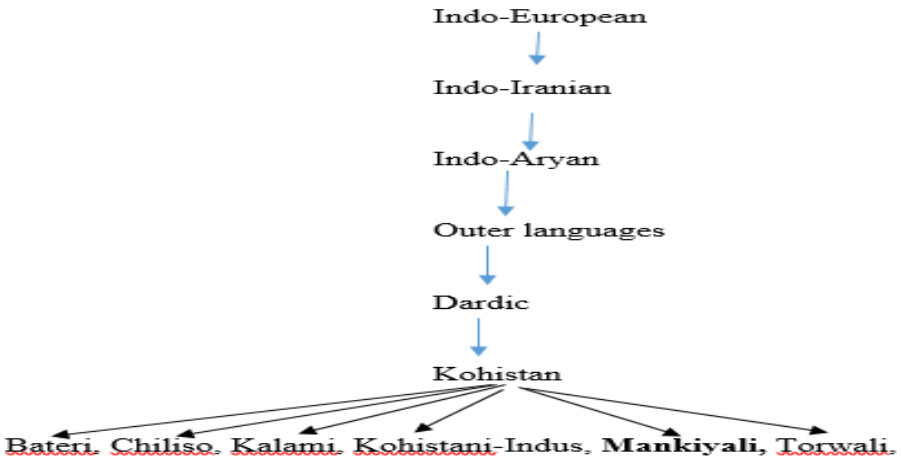

Figure 1. Mankiyali Relation with Other Languages

The speakers of Mankiyali live in Danna village, near the central city of Mansehra, which is 70-75 kilometresfrom Danna village. There are other villages where its speakers reside, such as Dimmaka and Galdar. Mankiyali speakers are multilingual; they can speak Urdu, Pashto, and Hindko when they come across speakers of these languages. They use their native language in local surroundings such as at home, in conversation in streets, mosques, shops, playgrounds, festivals, and religious ceremonies. There is no written grammar of it to be used at schools and other educational levels, and an ongoing shift is imminent, which is a dangerous red signal for its existence. This language needs research from a linguistics point of view on an urgent basis to save it from extinction. The present research aims to investigate the tonal features acoustically and introduce its contrastive ways of tone. As Pura, Gustilo, and Biermeier (2021) claim that humans produce new terminologies, but Zahra and Abbas (2022) say that language is easily affected. That is why the present research focuses the interest on the current position of Mankiyali.

Literature Review

Majority of the language in the world use tone for their words' meaning. All languages use intonation and pitch variation to convey syntactic information (Ladefoged & Johnson, 2010). Tone plays a significant role in distinguishing the meanings of individual words, and it is indicated by 50% of the world languages, and this figure may reach 70%. Some tonal languages exist in Southeast and East Asia, Africa, and South and North America.Some European languages have tonal features to a considerable extent, e.g., Norwegian, Swedish, Lithuanian, and Serbo-Croat, and some varieties of Basque and Dutch. Most languages practised in Europe do not use pitch at a word level but at a larger level like phrases and sentences and are known as intonation languages. The languages that use pitch at a broader level are Danish, English, and Italian (Davenport & Hannahs, 2005). The tone is represented in the simplest way where languages have two-way contrastive tones like high and low (Ladefoged & Johnson, 2010).

Pike is not the pioneer of tones, but still, there are clear indications in his work (1948) in which he has discussed many essential points which help decide and analyse the tones of a language. To him, tonal language would be lexically significant, having a contrastive pitch, and each syllable would have a relative pitch. The considerable pitch is characteristic of distinguishing the meaning of words/utterances. Contrastive means that one pitch would be changed from another in the immediate context (e.g., high and low or rising and falling). The tone would change the meaning of one word to another to the contrast between them. He also believes tonal language would have one significant pitch in each syllable. Tonal languages have monosyllabic, disyllabic, trisyllabic, and multisyllabic words. Lodge (2009) asserts that pitch is one of the auditory properties of sounds, and its changes produce tune in different words. Pitch is used in two different ways. One is used to differentiate words of the same languages, known as tonal languages, and the other is that its changes are noticed over utterances but not on particular words, known as intonation. Davenport and Hannahs (2005) distinguish tone and intonation by indicating that tone is the characteristic of individual words and syllables, while intonation has a much wider range, such as phrases and sentences. The other difference is that tone distinguishes words, e.g., minimal pairs and intonation varies clauses or sentencessuch as statementsand questions. Tench (2011) believes that tone is the movement and level of pitch that resides in the intonation unit.

This point indicates that there is no restriction on the number of syllables in words in tonal languages. Languages carry various numbers of syllables in words, and all these are acceptable for analysing tones in them.

The tone has been divided into two broad categories: level pitch register tones and gliding pitch contour tones. Pike describes these terms as: level tones are those where the pitch is not changed during their pronunciation, and gliding tones are those where the pitch is changed in the syllables (e.g., rise or fall). Contour tone is distinguished from register tone by various points: (a) there is a gliding, but no level;(b) the contour glide is not interrupted by morpheme boundary;(c) the initial and final points of these tones are not equal in the same syllable;(d) there is only one tone in each syllable in contour tone, but in the register, there may be more than two tones in a syllable (Pike, 1948). Pitch and pitch change play a significant role in the various categorisation of tone (Morey, 2014). Languages with tone properties use to pitch to differentiate lexical items, but this feature is not the property of European languages (Lodge, 2009). The tonal languages substitute one tone for another in a particular word or morpheme, causing changes in the denotation of that word or morphemes or sometimes changing the category of words (Roach, 2009).

Pike (1948) extends the point regarding register tone. A language with two registers would be labelled as high and low. And a language with three registers would be labelled as high, mid, and low. The third point is four registers and would be labelled as the high, mid, norm, and low.

According to Pike (1948), there is overlapping in deciding a language by register and contour tone. Languages are not clearly defined as register or contour tonal language, but this decision merely depends on the data which clarifies whether a language is register or contour tonal language. Similarly, the researchers do not decide on a language to be registered or contour tonal language before taking and analysing the data from the participants. The researchers' techniques will lead them to the final decision regarding contour or register tone.

Pike (1948) highlights the changes of tones that a word may have different tones in isolation when it is in a phrase. The researchers would choose a category (noun or verb) for analysing tone in a language. Coupe (2014) states that sometimes carrier sentence affects intonation. Pike extrapolates

that one toneme may affect another when another toneme immediately follows it. Non-lexical toneme occurs only in a phrase, not in isolation at the word level. He also believes that toneme is changed when words are added to the word with tone; it may be longer or shorter in the phrase than in isolation.

For analysing the tone of a language, the following steps may be helpful in recognition of tones: firstly, ear training, secondly aids for hearing, thirdly transcribing and checking early acoustic impressions, and lastly, recognition of tonal language (Pike, 1948). Tones are not learned through the writing system because they are not presented in written form, but it would be better to listen to native speakers and imitate them (Bowden, 2012 & Rice, 2014). Another way for tone recognition in a language is suggested in three stages by Hyman (2014) thus:

(i) Stage I determines the surface tonal contrasts and their approximate phonetic allotones. This is first done by considering words in isolation.

(ii) Stage II introduces the goal is to discovering any tonal alternations ("morphotonemics") which may exist in the language. This can be done by combining words to make short phrases or eliciting paradigms.

(iii) Stage III comprises the tonal analysis, the interpretation of what has been discovered in Stages I and II. At this point, one typically draws on theoretical constructs and formal devices, e.g. autosegmental notation, to help express one's insights into how the tone system works (p.526).

A list of the words is better to classify phonetically and grammatically. Phonetically, it is wise to manage groups of words as monosyllabic, disyllabic, trisyllabic, and so on. It is also essential to divide words into groups starting with voiceless or voiced stop consonants or vowels. Stress is another point to be noticed; stress and unstressed are categorised separately. Morphologically, words are compared in the same category: noun with noun and verb with verb (Pike, 1948). Investigating a language's tone requires transcription; it differentiates one segment from another. It is pretty straightforward to start with narrow transcription and leaves the words and phrases when they are not contrastive (Bird & Lee, 2014). Arranging the data is of utmost importance for analysing the tone of a language, the category of a noun is comparatively easy than other categories (Rice, 2014). Starting a word list with the category of nouns, listening to these words, transcribing them, and organisingensures the number of tones in a language. He further says that nouns are easiest, whereas verbs present complexity concerning tone (Hyman, 2014). Verb morphology is to be chosen for tonal analysis (Anderson, 1993), content words either in isolation or atphrase-level by Kutsch-Lojenga (2013), and lexical items in their respective categories (Coupe, 2014). The tone category may be different acoustically or perceptually in stressed and unstressed syllables. It is also different on syllables ending with voiceless coda and sonorant coda (Remijsen, 2014).

Dam (2018) opines that some terms are still used in the same manners Pike used (1948). Some of them have different use and shapes than others. He mentions tone register as high and low tone, and the cluster of low and high make contour tone. Sometimes, mid and high make contour tones.

All the words of a language have a certain pitch when they are pronounced, and they are marked for those pitches. They are languages with no change in meaning, but when meaning distinctions are marked with pitch, they are treated as tonal languages (Morey, 2014). When pitch variation changes, the meaning of words is called tone (Ladefoged & Johnson, 2010).

Pitch is considered the critical feature of tone that is included in tonal analysis. Similarly, phonation, duration, and intensity are also the features to be included in tone analysis (Morey, 2014). Dam (2018) claims that phonation plays a significant role in Southeast Asian languages. Brunelle and Kirby (2016) have also added to the same point that breathy and creaky phonation have an essential role and are common in lexical tone categories. Similarly, Pike (1948) extends the argument by another word (stress), affecting the toneme's quality, length, and height.

Tonal Features of Indo-Aryan Languages and Target Language

The Indo-Aryan languages are mostly tonal, but some have lost breathy voiced consonants, which are evident in Hindi-Urdu and some IA languages. They have different lexical tones in various forms, but it is not the quality of each language; some of them do not have a lexical tone. IA family spoken in the Northwestern IA territory has been divided into three categories based on the number of contrastive tones. Languages with three-way contrastive tonal features are: Hindko, Punjabi, Pahari-Pothwari, Sansiboli, Gujri, Kangri, Bangani, andto name a few. The languages having two contrastive tones are: Burushaki (which does not belong to the IA family but in IA territory), Shina, Indus-Kohistani, KundalShahi, Palula, Batera, Domaaki, Khowar, Ushojo, Gawar-Bati, Wotapori, Gowro, Chiliso, Dameli and Pashai. Some languages have contrasting tones of more than three, which are as: Kalam Kohistani, Khalkoti, and Torwali (Baart, 2014). The Indo-Aryan languages have a rich background in tonal features; among them, there are up to twenty tonal languages (Masica, 1991; Baart, 2014).

The contrastive tone is asignificant feature of New Indo-Aryan languages and dialects. Punjabi has a two-way contrastive tone such as high and low, but some view it as a three-way contrastive tone such as low, high, and mid/neutral (Masica, 1991).

Besides, Anjum (2016) asserts that Mankiyali has tonal features, and it belongs to the Dardic language group. She argues that Mankiyali voiced aspirated stops have been replaced by voiceless plosives followed by a low rising tone (p.123). The tone of Mankiyali is phonemic in nature.

The tone of Punjabi is prosodic, and it resembles the tone of Scandinavian in terms of acoustic and structural impressions. Its tone normally outspreads over two syllables; even monosyllabic words may contain the tone (Masica, 1991). Baart (2014) claims that some of the Punjabi-type tonal languages lost breathy voiced consonants like *bh, dh, ḍh, gh* and others. The sounds have merged with their counterpart voiced consonants *b, d, ḍ*, and *g*. It was also noted that these breathy voiced consonants merged with their voiceless counterparts like *p, t, ṭ,* and *k* when they occurred in an initial position of the words. The placement of stress in Punjabi and Northern Hindko is determined by morphology and syllable structure. Hussain (1997) defines the location of word stress by stating three rules; a, the right heaviest syllable carries stress b, if a heavy syllable is not found, then stress is held by the penultimate syllable; and c, word-final segments are not visible to stress rules. KundalShahi, Palula, and Ushooj are IA languages (Barrt, 2014) where stress is changed when a suffix is added to the stem.

The northwest IA languages arerich in tonal features with contrastive lexical tones (Baart, 2014). Dhillon’s study (2010) is based on IA language, where stress and tone are the main focus. He divided ten IA languages into three categories by their properties such as a) tone is attracted to stress, b) stress is attracted to tone,and c) no interaction is found between stress and tone. The tone of Dogri, Gojri, Kangri, Kalam Kohistani, and Punjabi is dependent on stress positions.

Punjabi carries tonal features (Bowden, 2012), which has a lexical tone at the word level and carries intonation at the phrase level. It is a three-way contrastive tonal language (Baart, 2014). The tones of Punjabi are lexically contrastive and they are represented as low tone, high tone, and level tone (Dhillon, 2010). Similarly, the tones of Gojri are precisely the same as the tone of Punjabi. They are low-rising, high-falling, and level-tone. High and low tones are specified lexically, and the level or mid-tone is unspecified, and it is represented as a default when there is no tone specification on the vowel (Dhillon, 2010). There is only one high or low tone in Punjabi words where the tone always falls on the stressed syllable (Dhillon, 2010). The polysyllabic words carrying high tones have an extra high pitch on the stressed syllable, and polysyllabic words carrying low tones have an extra-low pitch on the stressed syllable (Losey, 2002). The words having one syllable would be uttered on either level of moving tone. A falling tone is identified when the pitch descends from higher to lower pitch and a rising tone from lower to higher (Roach, 2009).

Punjabi is an IA language spoken in India and Pakistan (Hussain, Proctor, Harvey, & Demuth, 2019). Gojri, Dogri and Kangri have the same three-way (high, mid, and low) contrastive tone as Punjabi has (Dhillon, 2010). Kalam Kohistani has five contrastive tonal systems (Baart, 2004). Shina, Palula, Indus Kohistani, Lahndi, and Dameli have two contrastive tonal systems (Dhillon, 2010).

Kangri is an Indo-Aryan language witha three-way contrastive tone: low tone, high tone, and level or mid-tone (Eaton, 2008). The two tones (how and high) are lexically specified, whereas the mid or level tone is unspecified (Dhillon, 2010).

These examples of the IA languages show that two, three, and five contrastive tonal systems are found in these languages. The current study analyses the tone of Mankiyali, which is IA and the sister language of Bateri, Chiliso, Degano, Gowro, Kalami, Kohistani-Indus, Tirahi, and Torwali.

Some of the sister languages of Mankiylaithat were considered two-way contrastive tonal languages by Baart (2014) are Bateri, Chiliso, and Kohistani-Indus, and he named them “Shina-type tone languages”. Kalami or Kalami-Kohistani and Torwali were considered more than three-way contrastive tonal languages, which he labelled “Kalami-type tone languages”. As Pike (1948) claims that tonemes may be different even in the dialects of the same language. Sometimes, the number of tones is the same, but levels are changed, and sometimes number and levels are the same, but their occurrence is not the same at the word level in various dialects. In addition, Morey (2014) proposes that diversities are found in the number of tones in varieties of a language. He also believes that non-tonal language affects the lexical tone of tonal language when they are in contact.

A vast amount of literature explores the various exciting features of languages, such as tonal features and typology, but the tonal systems of Indo-Aryan languages have largely been unexplored. Primarily, there is a dire need to investigate stress and tone interaction with themselves in Indo-Aryan languages (Dhillon, 2010). Dogri tones are closely connected with stress and aspiration. A falling tone develops when aspiration precedes a stressed syllable, and a rising tone develops when aspiration follows a stressed syllable (Ghai, 1991).

KalamKohistani is a Dardic language in which stress always falls on the final syllable, and in rare cases, it is on the first syllable (Baart, 1999). Additionally, it has contour tones in terms of high-to-low and low-to-high (Baart, 2004). Kalam Kohistani is a tonal language with five-contrastive tone patternsin monosyllabic and polysyllabic words (Baart, 1997, p.41). He used the term melody for this five-way contrastive tonal feature of the language. The level melodies of the language have only one tone, and gliding melodies contain two tones. Based on this analysis, Kalam Kohistani contains two

elementary tones (High and Low), and the different combinations of these tones make up five various melodies or five-way contrastive patterns. These patterns are high, high to low, delayed high to low, low, and low to high. Tones are always related to vocalic phonemes, and the tones of Kalami are not randomly associated with vowels. They usually follow a pattern that starts from right to left. For example, disyllabic words contain a Low to High tone, and Low is associated with the first vowel and High with the second. If a word contains two tones and has one vowel, both tones are associated with that vowel (Baart, 1997).

Pitch is one of the significant features that distinguish lexical meaning in most languages of Pakistan. Torwali pitch marks the lexical items, and in some other Indo-Aryan languages, the pitch is the acoustic property that contrasts one word from the others. Torwali has four contrastive tone patterns such as high, low, rising, and falling.This inventory is also related to vowel length. Words with low and low-high patterns have mostly shorter vowels, while high and high-low have long vowels.One more property is identified by producing words in isolation. The phonetic realisation of Low, High, and Low-High pitch patterns is Low when the words are in isolation. The process of plurality takes syntactic and morphological strategies. In the morphological process, the tone plays a vital role in plurality, e.g., the words show a singular form have a Low-High tone, and plural forms have a Low tone (Lunsford, 2001).

Representation of Tones

IPA has recommended these symbols for tone ā, á, à, â, ǎ as cited in Morey (2014). Chao (1930) suggested integers from 1 to 5 for tones, as cited in Hyman (2014), where 1 is used for high pitch and 5 used for low pitch. He also mentions that IPA uses these vertical bars for five pitch levels [˩], [˨], [˧], [˦], [˥].Ladefoged and Johnson (2010) explicate that high pitch will be transcribed with an acute accent /aˊ/ and low pitch with grave accent /aˋ/, and mid-pitch is unmarked.

Methodology

The present study aims to analysethe tonal features of the language acoustically. For obtaining this purpose, the data were collected from three male speakers. These speakers have permanent residential places in Danna village, and their upbringings belong to thisvillage. They had rare exposure to the city. The stimuli for analysing tonal featuresare present in Table 1. The data were recorded in a soundproof room, saved ona laptop, and analysed using Praat (Boersma & Weenink 2009).

Table 1: Stimuli Used for Tone

Set 1	ga	went	ga	Cow	ga	Grinding wheat
Set 2	ʧa:l	beam	ʧa:l	Give space	ʧa:l	Chicken
Set 3	ʧa	three	ʧa	Tea	ʧa	What

Data collection

Three male native speakers were recruited from Danna village. All the above words are content words that carry meanings. Table 1 hasthree sets of words, and each set has three words that are different from one another through pitch. The total number of words is nine. These meaningful words are monosyllabic. The first two contain onset and nucleus, and the last word has onset nucleus and coda.

The list was given to native speakers of the language and directed them to utter them according to the different meanings they carry. They were also asked to have a natural voice in producing these sounds. Participants uttered all the words in isolation and repeated them three times. The collection of these utterances made 27 token (3 (words) x 3 (utterances) x 3 (speakers) = 27 tokens). All of them were archived on a laptop and saved in WAV files.

Recording

These recordings were done in the same place (Danna village). A high-quality tool (Zoom H6) was used for data collection, and all other experimental protocols were made. The recorder was checked repeatedly for better responses, and changes were made according to the clear voice and acoustic analysis requirements. Changes were made in settings, e.g., 44.1 kHZ and 16-bit. After completion of the recording, the files were saved in WAV forms and transferred to a laptop.

Results Related to Tone

The data for tonal analysis were analysed after the careful recording sessions. Each word had nine tokens, making every token the centre of interest. For analysing the tonal feature acoustically, one speaker was chosenfor one set from the collected data, the second speaker for another set, and so on. There were three different recordings, each with just one word but three utterances. These utterances have different meanings. The recorded data was heard repeatedly for understanding, followed by many discussions with the research supervisor. After descriptive analysis and data collection, the data were analysed acoustically. In the analysis of all these words, the focus was given to tonal features. After completion of the acoustic analysis, the tones were shown in Figures2, 3, and 4, respectively.

Table 2. The Acoustic Analysis of Stimuli Set 1 Used for Tone

Words/Transcription	Glossary	Tone
ga	Went	Rising
ga	Cow	Falling
ga	Grinding wheat	Rising-falling

All the above utterances were recorded from all three speakers. Every speaker uttered these words in adifferent recording. They uttered the words with meaning and then articulated all the words simultaneously without their meanings. The recorded data were saved in WAV files on the laptop. In the three different recorded data, as all three speakers uttered Set 1, only one speaker was randomly chosen and analysed the data. When data were annotated and extracted, then it was transferred into Praat Picture Window (PPW) to clearly show the tonal features. The spectrograms are given in Figure 2.

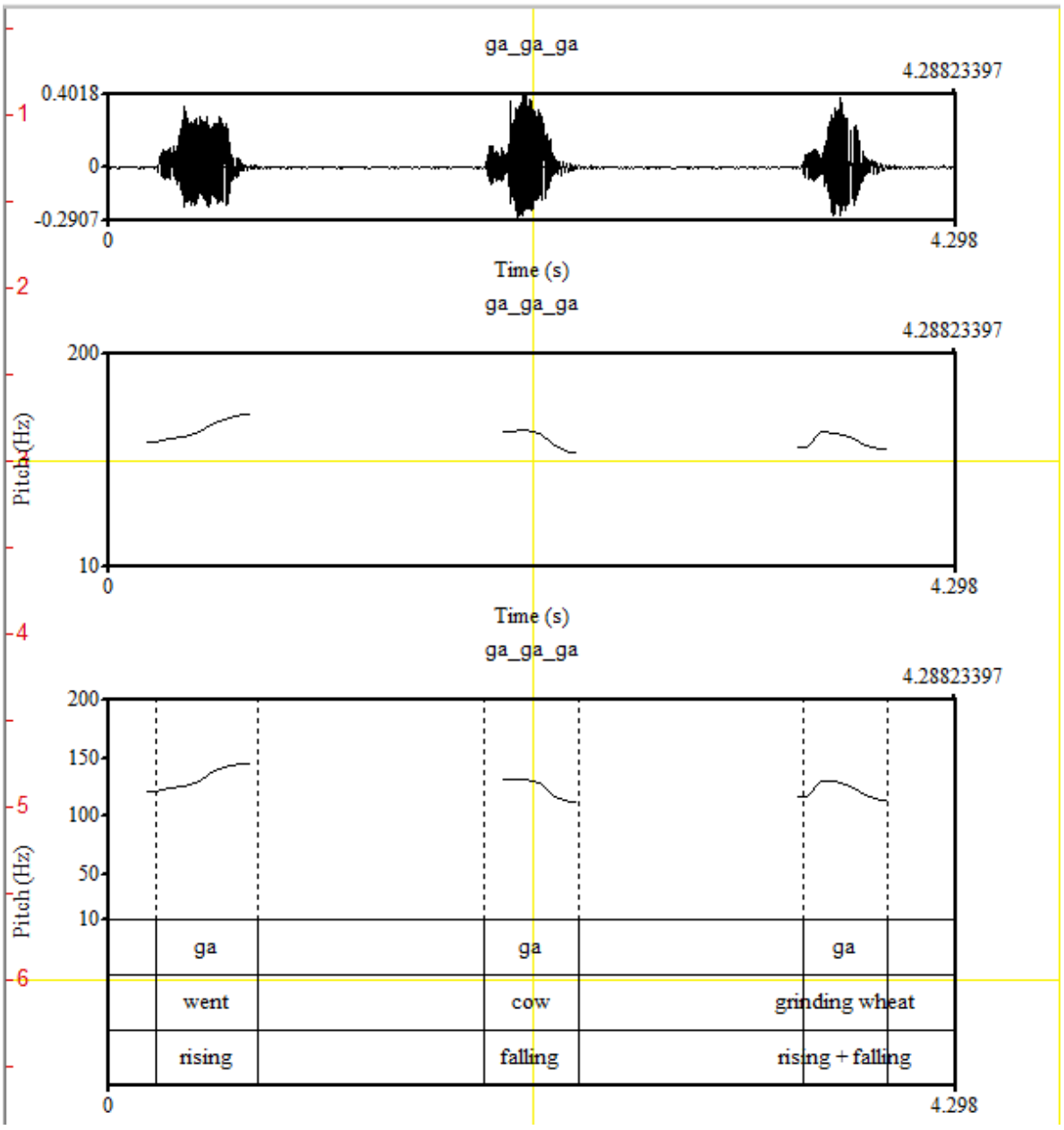

Figure 2. Spectrogram of the Tonal Features of the Word /ga/, Stimuli Set 1

This spectrogram shows the tonal feature of the single word /ga/. This representation was done through Praat and then moved to PPW. This window has three different parts which illustrate the existing features regarding tone. Every part has distinct characteristics, and these features represent the same word /ga/, but with different meanings and tonal properties. The upper part shows the spectrograms of the words /ga/. The middle part shows only the tonal features drawn automatically from Praat Object Window (POW). The last/lower part shows the detailed process and existing tonal features with physical properties. It shows the word's pitch, tone, transcription, and meaning. The word /ga/ means ‘went’ and has a rising tone. The word /ga/ means ‘cow’ and has a falling tone. The word /ga/ means ‘grinding wheat’ and has a rising-falling tone.

Table 3.The Acoustic Analysis of Stimuli Set 2 Used for Tone

Words/Transcription	Glossary	Tone
ʧa:l	Beam	Rising
ʧa:l	Give space	Falling
ʧa:l	Chicken	Rising-falling

This is Set 2 which contains single a word /ʧa:l/, but has different meanings. The meaning difference is found through the pitch. The words in Set 2 presented in Table 3 were recorded from the three native speakers. Each word was recorded with meaning and without meaning simultaneously. All the utterances were saved on a laptop and analysed then. The utterances of one speaker were chosen for Set 1, similarly, another speaker was chosen for Set 2. When data were annotated, extracted, and transferred into PPW to clarify and display the tonal features. The spectrograms the words / ʧa:l / were given in Figure 3.

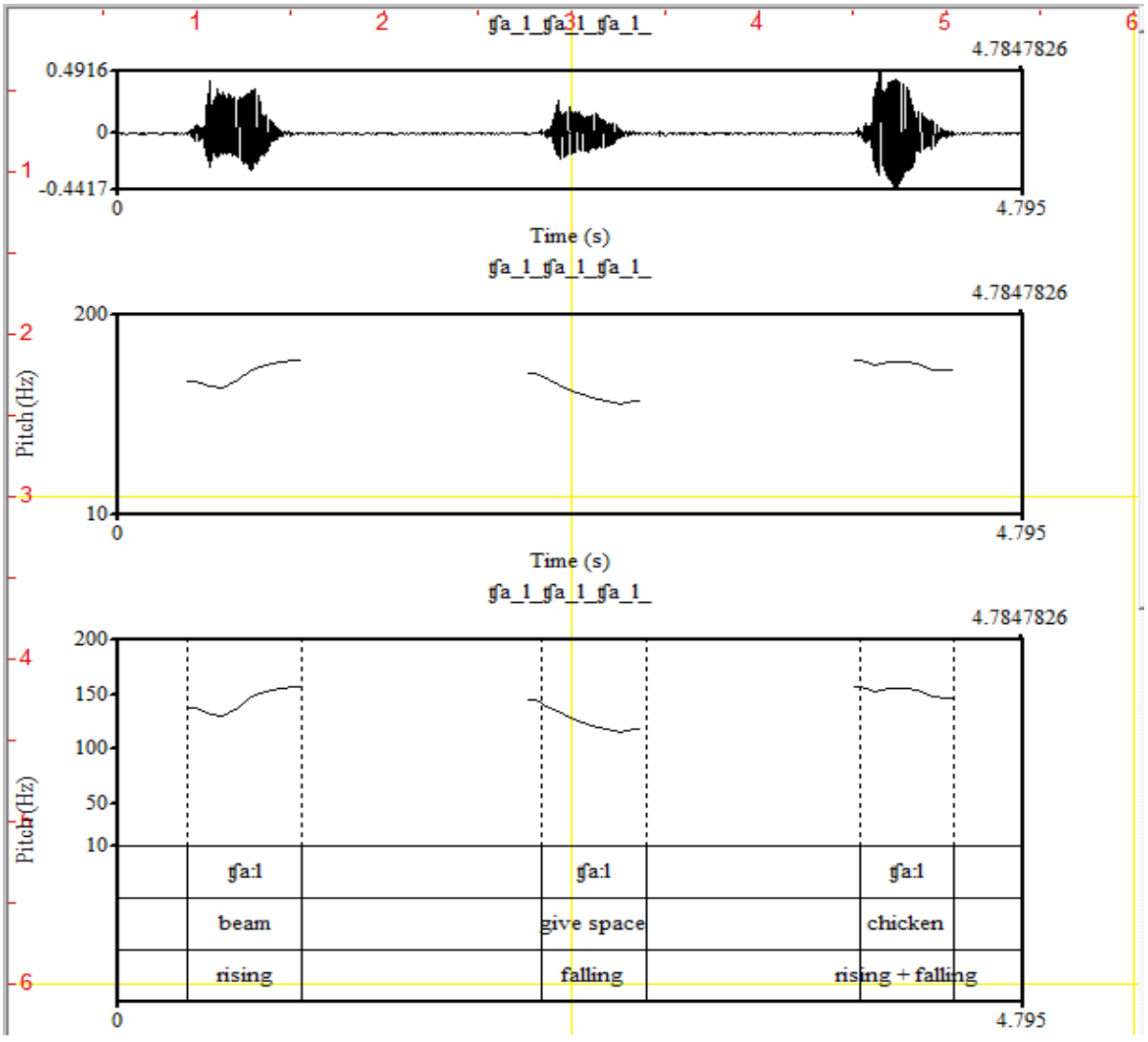

Figure 3. Spectrogram of the Tonal Features of the Word /ʧa:l/, Stimuli Set 2

This spectrogram shows the tonal features of the single word /ʧa:l/. This process was done through POW and then moved to PPW. All the elements were gathered in a single window. It shows that this window has three parts thatexemplify the various physical properties of the given word /ʧa:l/. In Figure 3, the first part shows the spectrograms of the words /ʧa;l/, which only represents the three apparent utterances/repetitions of the words. The second part is devoted to the existing tones in the word, which distinguishes the meaning through pitches. The last part provides the details combining the first and second parts with further details. The word /ʧa:l/ means 'beam' and has a rising tone. The words /ʧa:l/ means 'give space' and has a falling tone. The word /ʧa:l/ means 'chicken' and has a rising-falling tone.

Table 4. The Acoustic Analysis of Stimuli Set 3Used for tone

Words/Transcription	Glossary	Tone
ʧa	Three	Rising
ʧa	Tea	Rising-falling tone
ʧa	What	Falling

All the above utterances were recorded from the speakers in the same recording. These words were spoken with their meaning and they were uttered again without their meanings. The data were recorded and saved in a WAV file. When data were annotated and extracted, they were transferred into PPW. The spectrograms are given in Figure 4.

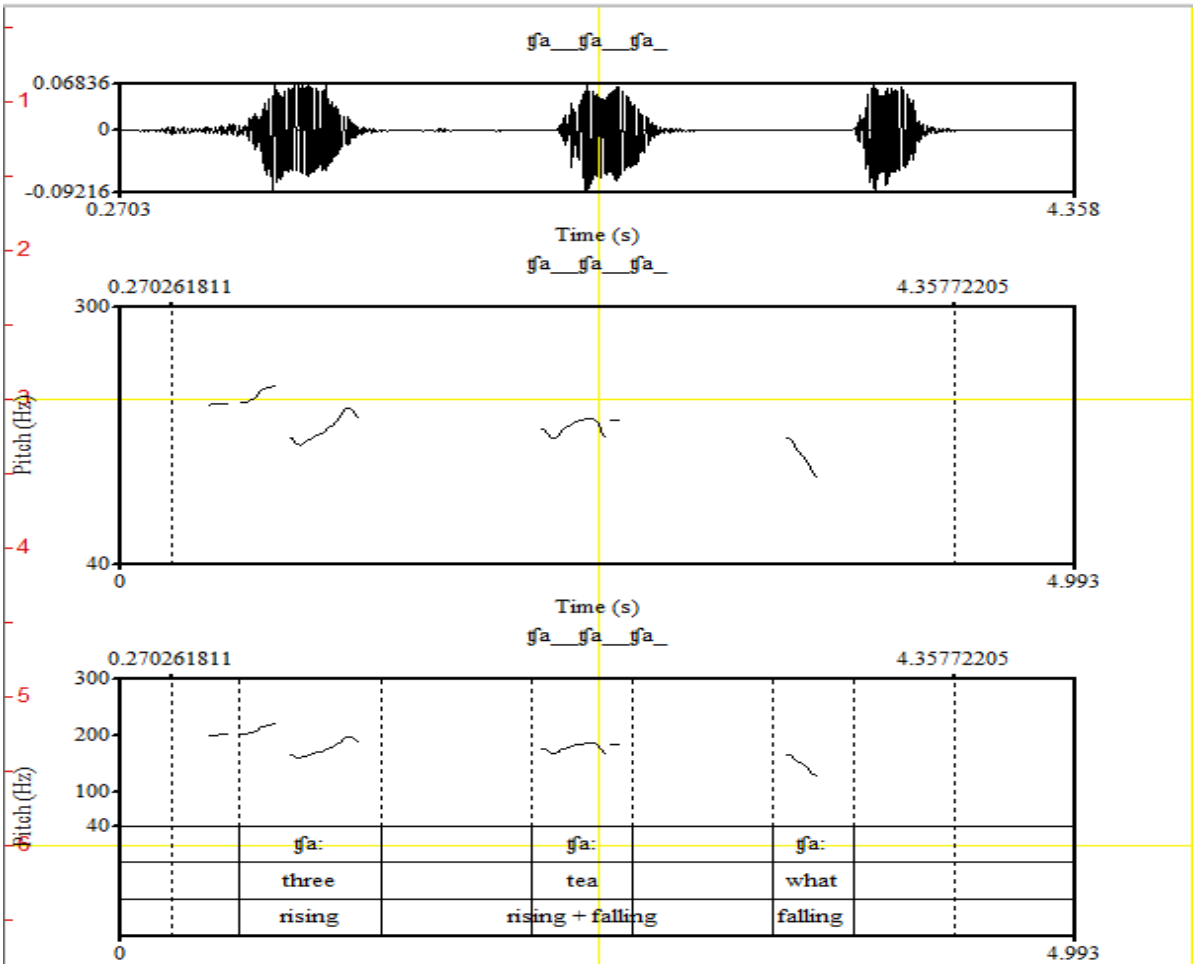

Figure 4. Spectrogram of the Tonal Features of the Word /ʧa/, Stimuli Set 3

This spectrogram shows the tonal feature of the single word /ʧa/. This representation was done through POW and then moved to PPW. This window has three different parts which illustrate the existing features regarding tone. The upper part shows the spectrograms of the words /ʧa/. The middle part only shows the tonal characteristics drawn automatically from POW. The last/lower part shows the detailed process and existing tonal features with physical properties. The word /ʧa/ means 'three' and has a rising tone. The word/ʧa/ means 'tea' and has a rising-falling tone. The word /ʧa/ means 'what' and has a falling tone.

Discussion

The presented data in Table 1 has three sets. These three sets have three repetitions of the same words. These words are the tokens of the same word but have different meanings observed through tonal features. Set 1 has the word /ga/ and got three occurrences. Similarly, Set 2 and Set 3 have three occurrences in each. The word /ga/ has three meanings: 'went, cow, and grinding wheat'. The words /ʧa:l/ has also three meanings: 'beam, give space, and chicken'. The word / ʧa/ also contains three meanings: 'three, tea, and what'.This illustration shows that these words and their identical representation have exciting features that give different meanings. These meanings are distinguished from one another through tonal features.

The data were recorded in audio forms from three speakers to have explicit representations of the tonal features. These three Sets (e.g. 1, 2, 3) were recorded from all three speakers, but in the acoustics analysis, only one speaker was chosen for a single set. While doing this process, one speaker was randomly selected for Set 1, another for Set 2, and another for Set 3. Therefore, all three Sets were covered, and all speakers' utterances were analysed.

The same procedure was applied for data recording and analysis. These sets were recorded in a soundproof room, saved on a laptop, and analysed with Praat. In the analysis, both windows were used. The recorded utterances were initially analysed in POW and then moved to PPWfor a separate and explicit representation of the physical properties of the words and tonal features. In PPW, the properties of the words regarding tonal features were separately organised and represented. The spectrograms were arranged on the top of the window, and the tonal qualities in the middle and the lower part weredevoted to details of the overall representation.

Figure 2 represents the word /ga/. This word has three-way tonal features. When this word is uttered with a rising tone it means 'went', with falling tone means 'cow', and with rising-falling tone means 'grinding wheat'.

Figure 3 represents the word /ʧa:l/. This word has three-way contrastive tonal features. The word having rising tone means 'beam', with falling tone means 'give space', and with rising-falling tone means 'chicken'.

Figure 4 represents the words / ʧa/. It also has a three-way contrastive tonal representation. The word with rising tone means 'three', with rising-falling tone means 'tea', and with falling tone means 'what'.

All the words contain a single tone. The tone may be different, as mentioned above. It is identified by pitch movement. A rising tone is identified when the pitch ascends from a lower to a higher level. The falling tone is identified from the pitch descending movement. The rising-falling tone is identified when rises towards high level and then descends again to reach the level when it has been started.

The shared property among the rising tone with all the words is that the tone rises slowly. There is no abrupt rising seen in it while the falling tone distinguishes from word to word. It does not have the same falling mood in all words. In words/ga/ and /ʧa:l/, the tone slowly falls, but in /ʧa/, it falls

suddenly. The rising-falling tone was also noticed with different moods. In the word /g/, the tone rises abruptly but falls slowly. In the word /ʧa:l/, it rises and falls slowly. In the word /ʧa/, it rises gradually but falls suddenly.

The tone of Mankiyali exists in monosyllabic words. As Pike (1948) observed, tonal languages surpass from monosyllabic to disyllabic, but the best way to represent tones is either monosyllabic, disyllabic or trisyllabic. That is why the present study has monosyllabic words for better results.

The family of IA languages hasa rich tonal background (Masica, 1991; Baart, 2005) and is divided into various categories based on the number of tones. Languages have two, three and more than three-way contrast. The languages having three-way contrastive tonal features are: Hindko, Punjabi, Pahari-Pothwari, Sansiboli, Gujri, Kangri, Bangani, and some others (Baart, 2014), and Gojri, Dogri, and Kangrialso have three-way contrastive tone (Dhillon, 2010). Similarly, Mankiyali is a tonal language and has three-way contrastive tonal features like Hindko, Punjabi, Pahari-Pothwari, Sansiboli, Gujri, Kangri, Bangani, Dogri and Kangri. Its sister languages have different tones such as Bateri, Chiliso, Gowro have two-way contrastive tones, KalamKohistani and Torwali have more than three-way contrastive tones (Baart, 2014).

Conclusively, it is saidthat Mankiyali is a three-way contrastive tonal language, but the properties of the tonal representation may vary from one another. It is a contour tone where the changes occur in pitch level. Rising tone always rises gradually;a falling tone sometimes falls slowly and sometimes suddenly. Rising-falling may sometimes rise and fall slowly, sometimes rise abruptly and falls slowly, and vice versa.

Conclusion

The present study aims to investigate the tonal feature of Mankiyali. It is an undocumented language spoken by a small community. It is an Indo-Aryan language. Its sister languages are Bateri, Chiliso, Degano, Gowro, Kalami, Kohistani-Indus, Tirahi, and Torwali. These languages have tonal features but are different from one another in the number of contrastive ways of tone. Some sister languages have two-way contrast, and some have more than three-way contrast (Baart, 2014). Paramour (2021) opined that Mankiyali has two-way contrast, but heindicated that it is a brief sketch andneeds extensive tone research. Therefore, it has dire need to investigate the tone of Mankiyali. Therecorded file from native language speakers to obtain the desired results. There were three data collection sets to get the desired results, and each set was recorded from all three speakers. Every set has three words that have different meanings. The participants uttered these words with meaning first, then without meaning. These utterances were recorded from three male native speakers through a high-quality Zoom H6 recorder and saved on a laptop then. In the acoustic analysis of the recorded data, only one speaker was randomly selected for a single set and analysed all the utterances deeply. Another speaker was chosen for another set, and so on. The results were obtained through acoustics analysis using Praat, and the spectrograms of every word with various pitches were given respectively. The change in pitch resulted in the meaning of words. The results revealed that there are rising, falling, rising-falling tones in the utterances of the native speakers. These results showed that Mankiyali has three-way contrastive tonal features and closely resemblesother IA languages such as Hindko, Punjabi, Pahari-Pothwari, Sansiboli, Gujri, Kangri, Bangani. The tonal features of Mankiyali are represented through rising, falling, and rising-falling tones. The rising tone is identified with the pitch ascending movement from lower to a high level. The falling is noticed with descending movement from high to lower, and the rising-falling is represented with ascending first and descending movement later. Thus, it is concluded that Mankiyali has a three-way contrastive and lexical contour tone.

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