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Punjabi Tonemics and the Gurmukhi Script: A Preliminary Study

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Punjabi Tonemics and the Gurmukhi Script:

A Preliminary Study

Andrea L. Bowden

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Arts

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ABSTRACT

Punjabi Tonemics and the Gurmukhi Script: A Preliminary Study

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Master of Arts

Punjabi, a language primarily spoken throughout Pakistan and in the northern Indian state of Punjab, is one of a few closely related Indo-Aryan languages, including Lahnda and Western Pahari, or Dogri-Kangri, which are counted among the world's tone languages, despite having no genetic link to other recognized tone languages. Few grammars have been published for Punjabi, and of those available, the grammars either fail to discuss the existence of lexical tone or note tone only in passing, and these disagree among themselves on even the number of tones. Unfortunately, those grammars which do make note of the presence of lexical tone often fail to discuss the tone patterns or tonemics of Punjabi in a linguistically meaningful way or provide substantial evidentiary support for their own claims regarding tone pattern. This may be due to the fact that, unlike Chinese, which has a contrastive pitch on each syllable, Punjabi "does not lean heavily on pitch phonemes" (Malik, 1995). Still, they are widely evident in the spoken language and are in need of descriptive research supported by significant empirical data. It is the conclusion of this research that the high and low tones found in the Panjabi language can be directly correlated to the classic Gurmukhi orthography. The script features historically aspirated and unaspirated variations of most consonants, which, in certain phonemic environments, are explicit indicators of the tonal qualities found in the spoken language.

Keywords: Indo-Aryan Languages, Gurmukhi, Punjabi, Panjabi, Tone, Tonemics

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1. Introduction.

This chapter will include an overview of the Punjabi language and the issue of how lexical tone functions in this language, an introduction to problems with previous research relevant to Punjabi tone patterns, a brief description of the solution to the question of how tone operates in Punjabi, and a discussion of proposed tonogenesis.

1.1. Punjabi and Lexical Tone.

According to recent estimates based on census data, there are more than 100 million native speakers of Punjabi and it has been classified as the 10th most commonly spoken language in the world. This language is widely spoken in Pakistan, with an estimated 76 million native speakers in that country, and approximately 33 million speakers in the north Indian states of Punjab, Haryana, and Himachal Pradesh. These estimates include speakers of differing dialects of Punjabi and speakers of the closely related languages Lahnda and Western Pahari, as these languages together form a dialectal continuum throughout northern India and Pakistan, spreading into the Himalayas. Historically, this region was a unified province of the British Empire known as Hindustan, but underwent Partition in 1947 at which time the area was separated into modern Pakistan and Punjab, India (Punjabi Language, 2012).

Punjabi is a member of the Indo-European language family, on the Indo-Aryan branch, which includes Sanskrit, Hindi, Urdu, Bengali, and Nepali, among others. The Punjabi dialect continuum has clearly been determined to possess tonal features, although it has no genetic connection with other tonal languages, including those that are geographically proximate, such as Tibetan and Chinese. This feature of Punjabi was

introduced into academic discussion by Bailey (1926) and Das Jain (1926) and has been discussed sporadically since that time, although subsequent research has provided little in the way of consensus or substantive evidence in support of claims regarding both number of tones and pattern of tones in this language. In fact, Punjabi is not recognized as a tone language by the current edition of *The World Atlas of Language Structures Online* (2012), perhaps due to the many discrepancies found in the existing research.

1.2. Previous Research.

Both published grammars of Punjabi and academic articles were consulted for comparison with the findings of this research. These sources largely contradict each other even regarding the number of tones, with claims ranging from two (Gleason and Gill, 1972) to four tones (Malik, 1995), and some sources on the Punjabi language failed to mention tones in any capacity (Tisdall, 1888; Ganathe, 2009). Most sources consulted in this research (Shackle, 1972; Bahri, 1972; Tolstaya, 1981; Bahri, 1982; Campbell, 1991; Masica, 1991; Arun, 1997; Yip, 2003; Kalra and Purewal, 2007) support the three-tone system in for Punjabi, however explanations for how tone functions vary, with some claims that tones are related to syllable structure or stress (Malik, 1995; Arun, 1997), while others claim a relationship between tone and historically aspirated consonants (Tolstaya, 1981; Masica, 1991; Fromkin, 1978; Campbell, 1991). Yip (2003) claims that both syllable stress and historical aspiration are relevant to realization of Punjabi tone. This relationship between tone and historically aspirated consonants is consistent with the findings of this research, however the data presented here show the tone pattern to be more complex than previous claims would indicate.

Furthermore, very little evidence is provided in any of the works to substantiate the claims made regarding either the number or the pattern of Punjabi tones. For example, both Masica (1991) and Yip (2003) support their claims by providing one set of three minimal pairs – one word each with level tone, falling tone, and rising tone. For this data each author provides a transcription and a gloss. Malik (1995) supplies that same data, however tone pattern set forth by that research claims a correlation with syllable structure. It should be noted that in much of the previous research, and also throughout this research, [`] is used to indicate falling pitch contours and [´] is used to indicate rising pitch contours. The data supplied by previous researchers are given below in Table 1.

	Level Tone	Falling Tone	Rising Tone
Masica(1991)	/koɾa/ 'whip'	/kòɾa/ 'horse'	/kóɾa/ 'leper'
Malik (1995)	/koɾā/ 'whip'	/kòɾā/ 'horse'	/kóɾā/ 'leper'
Yip (2003)	/ kōRaa/ 'whip'	/kòRaa/ 'horse'	/kóRaa/ 'leper'
Current Research	ਕੋੜਾ kora /koɾa/ 'whip'	ਘੋੜਾ ghoraa /kòɾa/ 'horse'	ਕੋੜ੍ਹਾ korha /koɾa/ 'leper'

Table 1. Minimal Pair Data

The data presented in this table is regularly used to make claims regarding the pattern of Punjabi lexical tone, and given that both Masica and Yip support the claim that tone is related to historically aspirated consonants, it is surprising that neither researcher indicates which words above contain these aspirates in their orthography. This is especially troubling given that Yip claims that “historically voiced aspirates lowered the tone” (p. 37), and there is no explanation at all provided for the environment leading to rising tone. Furthermore, the lexical item “leper” does not contain a historically voiced aspirated consonant. Of the lexical items presented as data from previous research, only the item “horse” includes a member of this consonant class, which includes the orthographic symbols ਘ ਙ ਞ ਢ ਢ. A full explanation of the orthography is provided below in section 4.3.

While it is not common for linguists to consider orthography in phonetic research, the relationship in Punjabi between the phonetics and orthography is well established, and so it is a simple matter to determine that the lexical item ‘leper’ does not contain a historically voiced aspirate in the orthography. Furthermore, this is simply not sufficient data to support these claims. Malik (1995) supplies a larger data set, but it still fails in one crucial aspect – all of the data used by previous researchers to support their arguments conform to a single environment type: following the consonants under consideration, each datum contains either an /o/ or an /e/, as will be seen later. Both of these vowels are classified as tense, and as tense vowels often have length as an enhancing feature, these, and other vowels with similar properties and behaviors, are classified by this research as bimoraic. Those vowels which do not demonstrate these properties and behaviors are classified by this research as monomoraic.

1.3. Proposal of this Research.

The failure of previous research to provide data demonstrating tone in multiple phonemic environments could be due to effort made to compare only minimal pairs distinguished only by tone. These are rare in Punjabi, as tone in Punjabi has a low functional load (Pike, 1956). As such, for this research more consideration was given to eliciting a balanced variety of environments which included aspirated and unaspirated, voiced and voiceless consonants, each preceded or followed by as many vowel environments as is allowed in Punjabi phonology. In allowing for elicitation and analysis of environments that did not strictly conform to the minimal pair designation, it became clear that while previous research has been correct in claiming that tones are related to the class of historically aspirated Punjabi consonants, the rules governing the realization of tone are not fully encompassed by this claim. Rather, each datum collected for this research indicates that vowel length and the position of the historically voiced aspirate within a word must also be taken into consideration.

For the purpose of expanding the analysis of Punjabi tones, the data presented here will include four items: 1. the lexical item as written in Gurmukhi, 2. a transliteration of the Gurmukhi, 3. an IPA transcription of the spoken lexical item, and 4. the gloss of the given lexical item. It should be noted that the transliterations are original to this research. Table 2 includes data with historically voiced aspirates occurring in both word-initial and word-medial environments with both monomoraic and bimoraic vowels, presented in this manner.

	Level Tone	Tone Contours
Word-Initial	ੜਿਜਕ	ੜੀਲ
	dzhidzaka	dzhiila
	/tʃɪdʒəkə/	/tʃɪlə/
	'reluctance'	'lake'
Word-Medial	Not Attested (!)	ਮਾਂੜੀ
		maandzhii
		/mǎnz̥i/
		'boatsman'

Table 2: Tone on Vowels Flanking Historically Voiced Aspirated Consonants (ੜ)

The data here indicate that in a word-initial environment, falling tone occurs on a bimoraic vowel which immediately follows a historically voiced aspirated consonant. while in an environment where the same consonant followed by a monomoraic vowel, no tone contour is found, and the lexical item is classified as having level tone. In the data where the historically voiced aspirated consonants occur in a word-medial environment, rising tone occurs on a vowel preceding the given consonant type, and falling tone occurs on the vowel following. This class of historically voiced aspirated consonants is variably realized in spoken Punjabi as voiced or voiceless depending on whether it occurs word-medially (voicing retained) or word-initially (voicing lost), which accounts for the voicing alternation found in this data set for the same consonant type.

1.4. Proposed Tonogenesis.

As mentioned above, tone in Punjabi is, in many cases, believed to be connected to a class of consonants which historically were voiced and aspirated, although in modern spoken forms, aspiration is lost and voicing is dependent on that consonant's position within a word. Punjabi in India is written in the Gurmukhi abugida, which is derived from Brahmi, and was developed by the sixth Sikh guru, Guru Angad Dev Ji during the 16th century. As with other Brahmic scripts, Gurmukhi is organized in rows and columns according to specific features, in this case by voicing, aspiration, and place of articulation. Gurmukhi is organized into columns which classify symbols by their phonetic realization. These columns are Voiceless Unaspirate, Voiceless Aspirate, Voiced Unaspirate, Voiced Aspirate, and Nasal. The columns organize the phones by place of articulation. A full table of the Gurmukhi orthographic system is provided in Appendix C. The orthographic symbols still accurately describe the spoken forms for the most part, however in the case of those consonants classified by the orthography as Voiced Aspirates, this is not the case.

Since the orthography was designed to describe a language already widely in use, it is reasonable to state that the consonant class identified by the orthographic system as voiced aspirates were exactly that at the time of the development of the writing system, but have since lost the aspirated phonetic property. Of the Punjabi language sources available, only Bahri (1972) and Masica (1991) recognize the relationship between the realization of tones and the historic aspiration indicated by the Gurmukhi orthography. The recognition of this relationship is crucial in understanding the Punjabi tone system, as the loss of aspiration leads to the tones now evident in this language.

1.5. Thesis Outline.

The remainder of this thesis will be organized into four main sections, including an ethnography of Punjabi, a critique section, method and results, and analysis and discussion. The ethnography will include a short history of the Punjab region with attention paid to political and religious considerations. The critique section will include a thorough discussion of existing literature regarding Punjabi tonemics. The method and results section will include information regarding the collection of data for this research and will present data relevant to the tone patterns introduced above. The analysis and discussion section will present generalized phonetic rules which govern the application of tones in Punjabi, as well as a discussion of the implications of these new findings.

2. Ethnography.

This chapter will provide an overview of the history of the Punjab region and Punjabi language, as well as a discussion of the circumstances that allowed for this study to occur.

2.1. The Punjab Region.

The Punjab region, which encompasses Pakistan and a large portion of northern India, as was historically referred to as Hindustan, was a unified province of the British Empire. In 1947 the region underwent partition, and was separated into East Punjab, which is the current state of Punjab in northwest India, and West Punjab, which is modern day Pakistan (Punjab Region, 2011). The name of the area, Punjab, references the local geography; *pənʒ*, ‘five’, and *ab*, ‘river, water’ references the five rivers which flow through the region – the Jhelum, the Chenab, the Ravi, the Sutlej, and the Beas rivers. East Punjab is largely an agricultural state, producing mostly rice and is referred to as the breadbasket of India.

2.1.1. Languages of Punjab.

The Punjabi language is the first official language of the Punjab state in India; it is also counted among the official languages recognized in the state of Haryana, the Union Territory State of Chandigarh, the state of Himachal Pradesh, and the country’s capital, Delhi. Chandigarh serves as the capitol city for both the state of Punjab and the state of Haryana. It is interesting to note that while there are an estimated 90 million speakers of Punjabi (Indo-Aryan Languages, 2012), speakers of the geographically proximate Hindi and

Urdu, which languages borrow and loan vocabulary extensively with Punjabi, view it as a low-class or substrata language.

In Pakistan, Punjabi is the most commonly spoken language, with over 40% of Pakistanis learning it as their first language. As Punjabis are the largest ethnic group in Pakistan, their language is used as a lingua franca, with an estimated 70% of Pakistanis being able to understand or speak the language (Punjabi Language, 2011). However, most Pakistanis write in Urdu, which is considered to be a higher-status language (Shackle, 1972).

Despite Punjabi occurring widely throughout the world, largely due to immigration, the language is not highly studied by English speakers, and as such, few grammars of the language have been published. Of the grammars available, most pre-date relevant revisions to the International Phonetic Alphabet (International Phonetic Alphabet, 2011), and so these grammars lack standardized symbols and notations in their phonetic descriptions, meaning that the notation of particular features, such as retroflex consonants or tone, vary from author to author. Some of these even lack a descriptive discussion of tone, or fail to discuss tone in a meaningful way. Of the grammars that do discuss tone, there lacks a consensus regarding the number of tones present in the Punjabi tonal system, with claims ranging from two to four tones. This disagreement extends to articles written about Punjabi, although most authors, of both articles and grammars of Punjabi, recognize the presence of three tones, which is consistent with the findings of this research, discussed below. The tone pattern is another point of disagreement to be discussed below. Some authors provide no description for the tonal patterns, while others provide differing hypotheses. As will be shown below, a major weakness in many of the arguments

suggesting tone patterns is that many of the authors use the same limited data set, consisting of a few sets of near-minimal pairs across the three tones, and four of these sets contain the same bimoraic vowel environment following the initial consonant. This data set is insufficient and the given environment is too limited to effectively determine the Punjabi tone system.

2.1.2. Religions of Punjab.

After the partition agreement of 1947 of the historically unified area Hindustan, many Muslim families in the eastern, Indian region, immigrated west to the newly formed nation of Pakistan and many Sikhs who had lived in the western, Pakistani region, immigrated to the new Indian state of Punjab. In this way, the once-unified historic region became largely segregated by religion. This is not to suggest there is total segregation in either section of Punjab – according to the 2001 census, Chandigarh’s population is more than 75% Muslim (Chandigarh, 2012). Many citizens of Punjab are also Hindu, and speak Punjabi natively, although the language is most closely associated with members of the Sikh religion, which is the dominant religion throughout rural Punjab. This is due to the fact that much of the Sikh scripture and literature was written with the Gurmukhi script, which was developed by one of leaders of that faith. Additionally, “[on] the religious and cultural plane, the language has a very special significance for the Sikhs, whose holy book, the Adi Granth, is the oldest text in the Gurmukhi script” (Campbell, 1991).

2.2. Language Information and History.

Punjabi, along with Hindi, Urdu, Bengali and others are all members of the Indo-Aryan branch of the Indo-European language family, whose speakers, it is estimated,

constitute one half of all Indo-European speakers, with 1.5 billion out of approximately 3 billion total speakers (Indo-Aryan Languages, 2012). It is estimated that “up to one-fifth of mankind speaks an Indo-Aryan language” (Masica, 1991), several of which, including Hindi and Urdu, are more regularly studied, and so are better understood than Punjabi. The Indo-Aryan languages are “spoken today mainly in India, Pakistan, Bangladesh, Nepal, Sri Lanka, and the Maldives Islands... although they are not the only languages spoken in any of these countries, their speakers in all cases constitute majorities (Masica, 1991).

Punjabi, and its closely related cousin-languages Lahnda and Dogri-Kangri, or Western Pahari, create between them a dialectal continuum spreading from Punjab, India, throughout Pakistan, and reaching into the Himalayas. Lahnda is primarily spoken in Pakistan and Western Pahari, or Dogri-Kangri, is spoken from Pakistan to Nepal along the Himalayan ridge (Dogri-Kangri, 2011). While currently there is some scholarship on these three languages, it is severely limited and largely outdated. Given the current political environment, it is not possible to perform language studies on Lahnda or Western Pahari, as it is not possible to travel to Pakistan.

There are three main dialects within what is recognized as Punjabi proper, which are Central, found from Amritsar to Lahore in the western area of Punjab, and providing the basis for Punjabi’s literary language; the Dogri dialects, found in northern Punjab; and the “more markedly divergent western dialects which gradually merge into Lahnda” (Campbell, 1991), and are found in Pakistan.

Regarding this group of languages, it is also stated that:

“Punjabi is the most important of the North-Western group of
New Indo-Aryan languages... Estimates of the total number of

Punjabi speakers vary from 40 to 70 million. It may be taken that the higher figure includes the estimated 20 million speakers of the closely related and contiguous language Lahnda.” (Campbell, 1991)

Recall from the introduction that modern estimates place the worldwide number of native Punjabi speakers at over 100 million (Indo-Aryan Languages, 2012).

The Punjabi language in India is written in the Gurmukhi script, meaning ‘from the mouth of the guru,’ which “is derived from Brahmi, and is set out in the same arrangement as the Devanagari” (Campbell, 1991). The history and formation of this script is more fully discussed below. Pakistani Punjabi is often written in the Shahmukhi script, meaning “from the mouth of the king,” however many Pakistani Punjabi speakers write in the Urdu language, which is more formal and viewed as a higher-class language. Regarding the written language:

“There is a considerable body of mediaeval literature, but, in general, Punjabi had to wait until the late nineteenth century before it stood much chance of competing with Urdu as a medium for literature. Today, the language is the natural medium in the state of Punjab for education, the media, and a large and flourishing literature.” (Campbell, 1991)

At the time that Gurmukhi was developed, few speakers were educated and wealthy enough to have attained literacy. Those who were literate include Sikh religious figures, and so much of the early literature constitutes religious writings and poetry.

3.0. Critique.

This chapter will include discussion of inconsistencies found in previous literature with regard to tones in Punjabi, including the proposed number of tones, the environment necessary for the realization of tones, and orthographic considerations.

3.1. Tones.

Punjabi is of great interest linguistically because it is one of three closely related Indo-European languages which conveys lexical information with the use of pitch contours. This is a unique feature, both among other members of the Indo-European language family and among other Indic languages. Other members of the Indo-European language family also employ pitch contours in the form of intonation patterns, but these communicate syntactic, rather than lexical meaning (Ladefoged, 1971). Tone languages, which use pitch variations to establish lexical meaning, are especially common in certain geographic regions, such as the Bantu and neighboring languages in Africa, and many South-East Asian languages, including Chinese. For type of pitch contour in a given language, the same vowel and consonant sequence will signify different words. This is accomplished when speakers employ different fundamental frequency patterns (Lieberman and Blumstein, 1988).

According to Pike (1956), each syllable of a tone language must carry at least one significant pitch unit. As it is pertinent to the discussion of tones in Punjabi, it should be noted that in a language with multiple tone contours, the middle, or neutral tone, is left unmarked in the phonetic transcription (Ladefoged, 1975). Punjabi employs both lexical tone at the word-level and intonation at the phrase-level. As a result, a fall in pitch marking the end of a sentence may cause a high tone to sound like a low tone (Ladefoged, 2003). In

order to account for this issue, all of the data collected for this research and presented below in Chapter 4 were elicited in isolation.

3.1.1. Number of Tones in Punjabi.

Previous literature on the Punjabi language demonstrates a number of inconsistencies with regard to the number of tones found in the language with claims ranging from two tones (Gleason and Gill, 1972) to four tones (Malik, 1995). Tisdall (1888) and Ganathe (2009) do not discuss the presence or function of tones at all. Gleason and Gill (1972) argue for two tones – high and neutral. Most researchers and Punjabi grammars support the three-tone theory for Punjabi, with the tones classified as neutral, high or rising, and low or falling. The three-tone system is supported by Shackle (1972), Kalra and Purewal (2007), Bahri (1972, 1982), Tolstoya (1981), Arun (1997), Masica (1991), Campbell (1991), and Yip (2002). Only Malik (1995) argues for a gliding tone system with four distinct tones, which he claims includes a rising glide, falling glide, a rising-falling glide, and the level or neutral tone.

3.1.2. Tone Environment.

Another point of discussion and disagreement in Punjabi language literature is the environment necessary for tones occur in the language. Kalra and Purewal (2007), aside from acknowledging the presence of three lexical tones, do not provide any further discussion of how or even where tones occur in Punjabi. In their grammar of Punjabi, Kalra and Purewal do not mark tones or try to teach them, stating their belief that such an attempt to teach tones would lead to confusion, that tones are not represented in the writing system, and that tones would be best learned by imitating native speakers. This

seems to indicate a belief that lexical tone in Punjabi is not systematic. While there is much disagreement in the literature about how and why tones occur in Punjabi, other authors offer systematic explanations.

Two authors, Shackle (1972) and Bahri (1982) argue that lexical tone in Punjabi can be correlated to inherent stress patterns. Bahri claims first that high tone and stress occur together, and then later that level tone and stress occur together. This author also claims that low tone is a marker of provincial speech. Unfortunately these claims create more confusion than clarification. Shackle (1972), in his argument relating tone contours to stress patterns, goes on to state that both of these features are dependent on syllable structure. Unfortunately, Shackle does not provide data to support these assertions, particularly with regard to multisyllabic lexical items, where supportive data would be crucial in substantiating his claims. Arun (1997) also support the claim that tone is directly correlated with syllable structure. Regarding the distribution of tones, Arun claims that “in the monosyllabics, [low tone] may occur on all vowels preceded by an unaspirated voiceless stop, nasals, rolled or lateral” (p. 37). In general, Arun argues that tone distribution has a relationship to number of syllables:

“In a few cases where the tone occurs on the second syllable, the vowel bearing the tone may follow a voiceless stop also, if the element preceding the stop is of the nature of a prefix... In all cases, the tone occurs on the stressed syllable only excepting the few cases where the originally stressed syllable has lost its force on account of grammatical reasons. The tone in trisyllabics occurs, as a general rule, on the second syllable

which is invariably stressed. But sometimes the tone remains on the first syllable which was originally stressed.” (p. 38)

Arun goes on to state that,

The disyllabics may have tone either on the first syllable or on the second. In the first case, the tone may occur on any vowel following a consonant of whatever type.

In all cases, the high tone occurs on the stressed syllable only.”
(p. 39)

These claims have not been found to be true according to the data elicited for this research. Malik (1995) contributes to this conversation, stating that, “Panjabi...differs very much from a tone language like Chinese which has a contrastive pitch on each syllable. It has only a lexically contrastive pitch spread over entire words or morphemes” (p. 85). Masica (1991) also argues that tone does not function at the syllable level, but rather that tone in Punjabi is prosodic and normally extends over two syllables.

Masica also claims that tone occurs only in environments that were historically aspirated. This claim is supported by Fromkin (1978), Campbell (1991), and Yip (2002). Fromkin states that “[in] Punjabi, breathy voiced consonants became voiceless unaspirated, leaving low tone on the following vowel” (p. 90), but does not provide data to support these conclusions. Campbell similarly argues that “the letter *h*, or a voiced aspirate, signals low tone on the following vowel; the *h* is mute, the aspirate is devoiced” (p. 1085), although once again fails to provide data to substantiate the claims made. Yip states that “in Punjabi (Bahl 1957, Chatterji 1969), only the historically voiced aspirates lowered the tone, whereas plain voiced stops grouped with the voiceless stops” (p. 37). No explanation is

provided for the creation of high tones, and while Yip does provide some data in support of these claims, this data consists of only one example of each tone type, which is insufficient in making substantial claims. Tolstoya (1981) also argues that tone is linked with historical aspiration, but claims that the tones only affect the stressed syllables of words. Once again, data is not provided which could substantiate this claim.

The authors above each discuss loss of aspiration as a source for modern tone contours, but in order to know whether an environment was aspirated historically, the orthography must be considered, as the orthography, which will be discussed more fully below, was designed to precisely describe sounds in the spoken language at the time of its inception. Bahri (1972) is the only author whose description of tone contours in Punjabi includes a discussion of historical aspiration in relation to the Gurmukhi script. He states:

“In the Gurmukhi writing system, whenever these occur in the word-initial position, the vowel immediately following carries a ‘low tone’ (à) and when used in the middle or end of the word it carries a high tone (á) on the preceding vowel. A very important difference in both the instances is that there is no ‘aspiration’ accompanying these sounds, as they may be found in other Indo-Aryan languages. In other words, these are heard as “voiceless unaspirate stops + low tone” on the vowel following and as “voiced unaspirate stops + high tone” on the preceding vowel.” (p. xix)

While these findings are compelling and partially supported in this study, the data analyzed below indicates a different complexity to the tonal system than is indicated by any of the previous research.

3.2. Data from Previous Research.

One of the main weaknesses outlined in previous research is a lack of evidence to support the varying claims regarding either number of tones or the phonemic environment necessary to create or allow for tones. Table 3 below compares the tonal data provided by Masica, Yip, and Malik in their discussions of Punjabi with phonetic symbols and tone marks retained.

Author	Level Tone	Falling Tone	Rising Tone
Masica (1991)	/koṙā/ 'whip'	/kòṙā/ 'horse'	/kóṙā/ 'leper'
Yip (2002)	/ kōRaa/ 'whip'	/kòRaa/ 'horse'	/kóRaa/ 'leper'
Malik (1995)	/koṙa/ 'whip'	/kòṙa/ 'leper'	/kṙa/ 'horse'
	/poli:/ 'hollow, soft'	/pòli:/ 'a thorny plant'	/pṙli:/ 'guileless'
	/te/ 'and'	/tè/ 'thirst'	/tṙ/ 'aim in life'
	/tṙṇa/ 'charm'	/tòṇa/ 'feel, fumble'	/tṙṇa/ 'to transport'
	/cola/ 'cloak'	/còla/ 'dainty'	/cṙla/ 'knapsack'

Table 3: Tone Data from Previous Research

This table shows that data presented by Masica (1991), Yip (2002), and Malik (1995) to substantiate their claims regarding the type and distribution of tone contours in Punjabi. All three researchers leave level tone unmarked and mark falling tone with the [] mark on the vowel where a tone contour is detected. Masica and Yip mark rising tone with [] on the affected vowel and Malik marks this tone with [] marked on the affected vowel. This

data is too limited to make any credible claims regarding the distribution of tones, in addition to which, Malik's data for falling and rising tone contours differs for "leper" and "horse" with the data of Yip and Masica. It is unclear where in this data historical aspiration existed as none of these researchers include orthographic information which explicitly indicates the presence or absence of aspiration. Furthermore, the data used is limited in its representation of word formation – all of the data presented by these researchers is monosyllabic or bisyllabic words and four of the five words used in this data set have the same vowel after the word-initial consonant. It is necessary to examine many different types of phonetic environments in order to gain a full understanding of Punjabi tone patterns. The data presented in previous research is far too limited to substantiate the claims made.

3.3. Vowel Length and Previous Research.

It is the proposal of this research that lexical tone in Punjabi is dependent on, among other things, vowel length measured in morae. Hyman (1985) states that "the weight of a syllable depends solely on the properties of its rime" and is not affected by the properties of the onset. The Punjabi language has a strong prohibition against codas, which means that for this language, the rime is most often a vowel. Vowels can be differentiated, then, by number of morae. A mora is a unit of timing, where each mora takes approximately the same length of time to say (Ladefoged, 1975). Punjabi vowels, which will be discussed in Chapter 4, are classified in this research as either monomoraic or bimoraic – certain vowels are one mora in length and others are two morae in length. Hyman also states that the morae "are typically called upon by tone languages to carry tone," and that "in most tone and tonal accent languages, it is the mora that is the tone-bearing unit."

Recall that above it was shown that four out of five of the data items used by previous researchers contains tonal environments containing only one vowel - /o/, with the remaining data item containing /e/. According to the findings of this research, both of these vowels, along with /u, i, ɔ/ are classified as bimoraic, and so would bear tone in the given environment – when occurring immediately after a word-initial historically aspirated consonant. As such previous data sets again prove to be insufficient. Punjabi has ten vowels, all of which must be considered for possible tone contours in varying phonetic environments.

3.4. Orthographic Considerations.

As has been mentioned above, the Punjabi language in India is written in an orthography known as Gurmukhi, meaning “from the mouth of the Guru” (Gurmukhi Script, 2011). This script is not an alphabet; rather it is an abugida, or alphasyllabary. An abugida is a writing system for which consonant notation is prioritized, and for which the notation of vowels is necessary, but secondary (Abugida, 2011).

Guru Angad Dev Ji, the second Sikh guru, developed this writing system as a derivation of the Brahmic script during the 16th century (Gurmukhi Script, 2011). Due to this history, this script has been adopted by members of the Sikh faith in writing the Punjabi language. Recall that another script, Shahmukhi, meaning “from the mouth of the King,” is also used for writing Punjabi. Shahmukhi is a derivative of Urdu and is used mostly by Muslim Punjabis living in Pakistan (Shahmukhi Script, 2011). This script will not be discussed, as it does not fall within the scope of the current study, however its existence as an alternate orthography for Punjabi is worth noting.

The symbols or letters in Gurmukhi and other Brahmic scripts are arranged in a specific pattern, in rows and columns that are largely organized by voicing, aspiration, and place of articulation. For a full table, see Appendix C. Within the Punjabi language, most consonants fall into one of five places of articulation: velar, palatal, retroflex, dental, and bilabial. For each of these places of articulation, there exists one orthographic symbol for each voiceless unaspirated, voiceless aspirated, voiced unaspirated, and voiced aspirated realizations, all of which are orthographically distinct, even though, as has been acknowledged by other researchers, some aspiration features have been lost in spoken Punjabi. Since the Gurmukhi script was developed in the 16th century to describe the sound system of Punjabi as it was actually occurring, it is reasonable and necessary to consider the classic orthography for evidence of historical aspiration.

3.5. Proposed Solution.

Unlike previous works, this research examines a wide range of environments in order to account for Punjabi tonemics. Syllable weight, historic aspiration, and the position of historically aspirated consonants all play a role in determining whether tone occurs in a given word and whether that tone is neutral, rising, or falling. No previous research has taken all of these factors into consideration when making claims about the tone system in Punjabi. Below is a table comparing claims made by a selection of previous researchers with data from this research used to support portions of their claims and refute other portions of their claims.

Authors	Claim	Explained	Not Explained	Issues
Masica (1991)	1. Tone occurs in historically voiced aspirated environments.	ਘੁਰਨਾ ghurna /kùrna/ 'to stare'	ਘਿੱਗੀ ghigii /kɪɡɪ/ 'sobbing hiccup'	Historically voiced aspirate with monomoraic vowel and no tone in 2 nd term.
	2. Tone occurs with /h/.	ਹੰਢਾਉਣਾ handhaunna /həndaʊə/na/ 'to wear out'	ਹੱਠਾ hathaa /həʈa/ 'large shop'	Second word contains two instances of /h/ with no tones.
Yip (2003)	1. Historically voiced aspirates lower tone.	झील chhila /tʃɪlə/ 'lake'	झिड़क chhiraka /tʃɪʈəkə/ 'rebuke'	Historically voiced aspirate with monomoraic vowel and no tone in 2 nd term.
Teach Yourself Series (Bahri, 1982)	1. [h] in the medial or final position of a syllable is actually high-falling tone.	टैह tauhora /təhəɾə/ 'elegance'	तेहीन tauhina /təhɪnə/ 'insult'	Second word contains /h/ with no tones.
Current Research	1. Rising tones occur on vowels preceding historically voiced aspirates.	ਸੁੰਘਣਾ sungenna /súŋgəʈə/ 'to smell'		
	2. Falling tones occur on bimoraic vowels following historically voiced aspirates.	ਭੂਰਾ bhuraa /pùra/ 'brown, tan'		
Table 4: Claim Comparison. Historically Voiced Aspirates: ਘ ਝ ਢ ਧ ਢ				

This table shows that the claims made by previous researches to explain Punjabi tonemics do not account for the tone patterns found in the data collected for this research. More data in support of current claims will be presented below, and these claims are that 1. Punjabi lexical tone is a remnant of historical aspiration, and so these tones can be anticipated by studying the orthography; 2. Punjabi vowels should be classified as either monomoraic or bimoraic, and this distinction aids in understanding the distribution of Punjabi tones; and 3. Tone patterns in Punjabi are determined by the position of the historically aspirated consonants within a word form. These claims will be further substantiated in the following chapters.

4. Method/Results.

This section will include two main sections, methodology and data. The methodology section will describe how specific lexical items were chosen for this research, how the elicitation sessions were conducted, and how data was recorded and analyzed. The data section will include examples of the elicited data relevant to the discussion of the phonology and tonemics of Punjabi.

4.1. Methodology.

Four subsections will be discussed here: a description of the focused elicitation, biographical information for the native Punjabi speaker, a description of the elicitation sessions including methods of data collection, and lastly an description of the processing of the collected data.

4.1.1. Elicitation Preparation.

In order to attain a full representation of the phonemic inventory in Punjabi, elicitation lists were compiled, including examples of each consonant, with special consideration given to those places of articulation containing consonants with variable realizations – those classified by the orthography as voiced aspirates. These include the velar, palatal, retroflex, dental, and labial consonants, including voiced and voiceless, aspirated and unaspirated examples for each. Twenty of Punjabi's consonant phonemes are included in this set of classified consonants. Examples of each of these was extracted from either the Punjabi-English English-Punjabi Dictionary (Goswami, 2010) or Pradeep's Latest Punjabi-English Dictionary (2006). Attention was also given to whether the

consonants mentioned above occurred word-medially or word-initially. For those words for which these consonants occur word-initially, each was elicited with all possible Punjabi vowel environments represented. So for each consonant type, each was elicited word-initially with each of Punjabi's ten vowels following the initial consonant. Two samples of each were attempted, however not all consonant-vowel combinations were represented in the Punjabi lexica or language. Unrepresented or illegal consonant-vowel combinations and the purpose for these missing clusters pose an interesting question, but it is beyond the scope of this study.

The remaining Punjabi consonants were also elicited in the word-initial position, with effort made to represent the consonants under consideration in word-medial environments. It is important to note that not all of the consonants extant in Punjabi occur word-initially, or even regularly in the written language. For example, of the five nasals, two occur word-initially, one only medially, and two are rarely found in the written language at all, but rather are represented diacritically with either a *tipi* as shown above, or alternately a *bindi*.

In total, six hundred forty-seven terms were elicited for evaluation in this study. These included approximately five hundred terms that are formed as described above. The remaining terms were taken from the Swadesh List. For ease of reference, each term was given a numeric designation. Due to the wide variety of similar consonants in Punjabi, very few true minimal pairs exist in the language. While effort was made to establish consistent patterns in the data, limiting the study to minimal pairs, while ideal given a large number of such terms, would not be effective given the small number of such pairs. The elicitation

materials were prepared in three columns – one each for the desired Punjabi word written in the Gurmukhi script, the English gloss, and the IPA transcription.

4.1.2. Biographical Information.

Due to the difficulty in finding literate, native-speaking Indian Punjabis locally, this research reflects data collected from a single speaker. For the purposes of this research, and to maintain his privacy and anonymity, the informant will be referred to as Gobind. Gobind was born in Gurdaspur, in the Punjab district in northwest India in 1954. Gurdaspur is ten kilometers from the India-Pakistan border. Recall that Punjab, India is largely an agricultural state. Gobind grew up in a farming family, working and walking to grade school, which at the time of his attendance, was ten years in duration. After completing school in Gurdaspur, Gobind moved to Amritsar, also in Punjab, to study Chemistry and then pursued a Master's Degree specializing in oils, soaps, and detergents at Guru Nanak Dev University. This degree included coursework in industrial technology, industrial economics, chemical engineering, chemistry, instrumentation, and quality control particular to the industry. Once Gobind's education was complete, he went to work for Stepan Chemicals for three years, first as a shift supervisor, and later as a general supervisor. Later, he went to work for Oswal Chemicals in Ludhiana for two and a half years in that company's bar soap plant.

Gobind immigrated to the United States in 1984 to California's Bay area. In 1985, he relocated to Salt Lake City and has been working in a detergent plant, and has remained with that company since, working in different capacities. He is married to a Punjabi woman who immigrated shortly after he did and they have two adult sons. Gobind and I became aware of each other through a mutual acquaintance while I was in India, studying Punjabi.

We exchanged emails discussing this research and he agreed to act as the linguistic informant.

4.1.3. Elicitation Sessions.

All elicitation sessions took place in Gobind's home in the Salt Lake area, as this was determined to be the most convenient arrangement for him. There were six sessions in total, each lasting between one and two hours, including rest breaks in order to minimize fatigue and boredom. The informant was asked to speak each of the six hundred forty-seven words in isolation, repeating each term three times. These sessions were recorded using a Sony IC Recorder: model ICD-PX820. In total, more than six hours of data were recorded. As Gobind spoke each term, I recorded a phonetic transcription on the prepared elicitation sheets.

4.1.4. Preparation of Data.

After each elicitation session, all audio files were uploaded onto my personal computer for editing and analysis and all transcriptions were typed out into the elicitation plan documents. The audio files were edited using Fission audio editing software, v.1.6.10. Each data item was spliced individually from the elicitation files and given a numeric designation, which corresponded to the designation given to the transcribed form. Finally, each individual data item was analyzed using Praat, version 5.2.25.

4.2. Results.

The first section below will determine a phonemic inventory of Punjabi, the second section will discuss the relationship between the Gurmukhi abugida and the established

phonemes, and the third section will introduce the number and type of tones found in the Punjabi language.

4.2.1. Phonemic Inventory of Punjabi.

This section will present and analyze phonological data collected during private elicitation sessions with Gobind. Since the relationship between the Gurmukhi script and the phonemes of Punjabi are a major point of discussion, the spelling of each word in the classical orthography is included in the data set, along with IPA transcriptions and transliterations. Table 5 below includes representative data from these elicitations for the purpose of establishing the phonemes occurring in spoken Punjabi.

ਕਟਣਾ	ਖਾਕਾ	ਗੀਣ	ਘੁੰਗੂ
katanna /kəʈəṇa/ ‘to cut’	khaakaa /kʰaka/ ‘map’	gaauun /gaʊn/ ‘song’	khuunguu /kūṅgu/ ‘owl’
ਚੀੜਾ	ਛਿੱਲ	ਜੀਭ	ਝਿੜਕ
chiirhaa /tʃiɾa/ ‘stiff’	chhil /ʃilə/ ‘bark, peel’	dziibh /dʒibʰə/ ‘tongue’	dzhirhak /tʃiɾəkə/ ‘rebuke’
ਟੌਹ	ਠੋਕਾ	ਡੌਂਗਾ	ਢੋਗ
tauhar /tohorə/ ‘pomp’	thokaa /tʰoka/ ‘carpenter’	daungaa /dʌʊŋga/ ‘serving bowl’	dhaug /dʌʊg/ ‘trick’
ਤੈਸ਼	ਥੈਲਾ	ਦੇਗ	ਧੀਰੇ
tesha tʃʰə ‘anger’	thelaa /tʰɛla/ ‘large bag’	dega /dɛgə/ ‘kettle’	dhiire /tʰiɾe/ ‘slow’
ਪੁਸ਼ਾਕ	ਫੁਲੇ	ਬੋੜਾ	ਭਾਵੁਕ
puushaaka /puʃakə/ ‘top garment’	phuule /pʰule/ ‘popcorn’	bodzaa /bodʒa/ ‘pocket’	bhavak /bavəkə/ ‘sentimental’
ਸੌਖਾ	ਸ਼ਾਂਤੀ	ਨਚੋੜਨਾ	ਮੇਜ਼
saukhaa /saʊkʰa/ ‘convenient’	shaantii /ʃānti/ ‘peace’	nachorhna /nətʃoɾna/ ‘to squeeze’	medz /mejdʒə/ ‘table’
ਯਤੀਮ	ਵਾਲ	ਹੰਜੂ	ਛੁਰਾ
yatiim /jəti:mə/ ‘orphan’	vaal /val/ ‘hair’	hundzuu /həndʒu/ ‘tears’	chhuraa /ʃoɾa/ ‘dagger’

Table 5: Phonemic Inventory

Historically Voiced Aspirates: ਘ ਝ ਢ ਧ ਭ

4.2.2. Consonant Inventory and Analysis.

Table 7 below gives the extant consonants in Punjabi. As is clear from the data presented above in Table 6, both voicing and aspiration are independently distinctive in this language. These are not allophones, rather they must be considered to be separate phones as, in many cases, the [+aspirated] feature is directly correlated to the placement and pattern of tones and the creation of minimal or near-minimal pairs. The Gurmukhi script distinguishes these phonemes from one another, and in order to accurately analyze and understand the tonal system, these must be considered as distinct from a linguistic standpoint as well. The table below shows an inventory of consonants found in spoken Punjabi.

Punjabi Consonants			Labial	Dental	Retroflex	Palatal	Velar
Plosives	Voiceless	Unaspirated	p	t	ʈ	tʃ	k
		Aspirated	p ^h	t ^h	ʈ ^h	tʃ ^h	k ^h
	Voiced	Unaspirated	b	d	ɖ	dʒ	g
		Aspirated					
Nasals			m	n	ɳ	ɲ	ŋ
Fricatives	Voiceless		f	s		ʃ	
	Voiced			(z)		ʒ	
Flap/Tap				r	ɽ		
Aspirate, Semi-vowel, Liquid			v	l		j	h

Table 6: Consonant Inventory

As is clear from the data in Table 5, Punjabi has an extensive inventory of phonemes.

Regarding the voiced dental fricative /z/, it has been placed in parentheses due to the fact that the phoneme is quite often interchangeable with the more common /dʒ/ or /ʒ/. For example, a common piece of clothing is a kameez, which is alternately pronounced /kəmiʒ/ or /kəmidʒ/. The impression given during time spent in India and discussions with native

speakers both gave the impression that the latter pronunciation is seen as provincial or low-caste.

Those consonants that are of specific concern to this study are all of those that fall under the categorization ‘plosive,’ as shown extensively in the table above. For each of the given places of articulation, four distinct consonants occur: voiceless unaspirated, voiceless aspirated, voiced unaspirated, and voiced aspirated. It is the historically voiced aspirated consonants which have a clear association with lexical tone and will be fully explored in the Analysis section.

4.2.3. Vowel Inventory and Analysis.

The data in Table 5 provides sufficient support for the vowel inventory presented below in Table 7.

Punjabi Vowels

	Front	Near-Front	Central	Near-Back	Back
Close	i				u
Close-Mid	e	ɪ		ʊ	o
Mid			ə / ʌ		
Open-Mid		ɛ			ɔ
Open		a			

Table 7: Vowel Inventory

In addition to these, Punjabi has three diphthongs: /ej/, /oj/, and /aʊ/. Punjabi vowels can be categorized into two groups, according to syllable weight or number of morae. The vowels /i, e, ɔ, o, u/ are taken to be bimoraic while the vowels /ɪ, ɛ, a, ə, ʌ, ʊ/ are taken to be monomoraic. The significance of this distinction will be illustrated in the analysis section.

It is also worth noting that the data Table 5 contains many instances of complex consonant clustering in the orthography, with little clustering represented in the

transcription. In fact, there are few legal consonant clusters in Punjabi. By far, most of those that occur in the written form are broken up by an inter-consonantal schwa. The schwa in Punjabi is considered its own full, distinctive phoneme and while it lacks a formal written designation in Gurmukhi, it is employed regularly and predictably, thus avoiding illegal clustering, which in Punjabi is almost any consonant clustering at all. Recall the discussion above regarding the historical origins of the Gurmukhi script – consonants in the Brahmic family of scripts carry inherent vowels.

4.3. Relationship of Phonemes to Gurmukhi.

The development of the Gurmukhi script in relation to the sound system of the language is well established.

4.3.1. Consonants.

Gurmukhi contains thirty-two independent consonant symbols, as well as six symbols which represent borrowed phonemes and are used primarily in loan words. In addition to these, some consonant symbols can occur as subscripts, which indicate a subtle presence of a given phoneme or may indicate the lack of the usual inter-consonantal schwa. For example, in the case of a borrowed word with a normally illegal consonant cluster, such as /pr/ or ‘ਪਰ’, Punjabi would allow for a usual /ਪ/ symbol with a rota-subscript, ‘ਪ੍ਰ’ indicating that the two phones are to be pronounced together, as /pr/. Under normal circumstances, such a sequence of Gurmukhi symbols would indicate the presence of an inherent mukta (schwa), and would therefore be pronounced as /pər/.

The Gurmukhi consonants and their IPA equivalents are as follows:

Gurmukhi Consonants			Labial	Dental	Retroflex	Palatal	Velar
Plosives	Voiceless	Unaspirated	ਪ /p/	ਤ /t̪/	ਟ /ʈ/	ਚ /tʃ/	ਕ /k/
		Aspirated	ਫ /pʰ/	ਥ /t̪ʰ/	ਠ /ʈʰ/	ਛ /tʃʰ/	ਖ /kʰ/
	Voiced	Unaspirated	ਬ /b/	ਦ /d̪/	ਡ /ɖ/	ਜ /dʒ/	ਗ /g/
		Aspirated	ਭ /bʰ/	ਧ /d̪ʰ/	ਢ /ɖʰ/	ਝ /dʒʰ/	ਘ /gʰ/
Nasals			ਮ /m/	ਨ /n/	ਣ /ɳ/	ਵ /ɲ/	ਙ /ŋ/
Fricatives	Voiceless		ਫ /f/	ਸ /s/		ਸ਼ /ʃ/	
	Voiced					ਜ਼ /z/	
Flap/Tap				ਰ /r/	ੜ /ɽ/		
Aspirate/Semi-Vowel/Liquid			ਵ /ʋ/	ਲ ਲ		ਯ /j/	ਹ /h/
				/l/			

Table 8: Gurmukhi and IPA – Consonants

Members of the class of borrowed consonants are those that occur with a small subscript to the bottom left of the letterform. These are called “per bindi” in Punjabi, or “with a dot.” These are not to be confused with those letters that can have a letterform subscript, such as the rota discussed above. Those with letter-form subscripts indicate a borrowed consonant cluster, whereas the letters with a dot indicate a borrowed phoneme. In Table 8, for three of the borrowed phones, their letter symbol is paired with the natural Punjabi symbols, as the difference in pronunciation is minimal and not easily distinguished, whereas regarding the remaining three borrowed phones, each of those are very different from the classic Punjabi phonemes, and so are classified independently and occupy their own spaces on the phonemic chart.

As is clear from the information provided in Table 8, there exists for Punjabi nearly a one-to-one relationship between a given phoneme and its Gurmukhi representation for

consonants. Recall that the historically aspirated plosives are of special interest to this discussion as it is these that are closely associated with the distribution of tones in the language. This will be discussed in greater detail below.

4.3.2. Vowels.

The system for vowel representation is less straightforward than that for consonants in this language, as the writing system is an alphasyllabary and not an alphabet proper. Recall above that in an abugida, the vowel notation is necessary, but secondary. The Gurmukhi script has only three vowels which hold status equal to, or nearly equal status to, consonants: ਊ /uɾa/, ਏ /ɛɾa/, and ਏ /iɾi/. These are the only vowel representations that occur in the alphabet system, and are known as “independent” vowels, although, with the exception of ਏ (ɛɾa), they cannot occur without an adjoined dependent vowel. In order to fully represent the vowel system in Punjabi, Gurmukhi also has the *matravan*, or the dependent vowels. These are not found in the alphabet proper and are represented as diacritics in the orthography. As discussed previously, each consonant in Punjabi carries an inherent “ə” after it’s pronunciation unless one of the *matravan* is present. The Gurmukhi vowel diacritics are shown in Table 9.

Gurmukhi Vowels

Independent	Dependent (none)	With /k/	Name	IPA
ਅ		ਕ	Mukta	[kə]
ਆ	ਾ	ਕਾ	Kanna	[ka]
ਇ	ਿ	ਕਿ	Sihari	[ki]
ਈ	ੀ	ਕੀ	Bihari	[ki]
ਉ	ੁ	ਕੁ	Onkar	[kʊ]
ਊ	ੂ	ਕੂ	Dulankar	[ku]
ਏ	ੇ	ਕੇ	Lavan	[ke]
ਐ	ੈ	ਕੈ	Dulavan	[kɛ]
ਓ	ੋ	ਕੋ	Hora	[ko]
ਔ	ੌ	ਕੌ	Kanora	[kɔ] / [kaʊ]

Table 9: Gurmukhi and IPA – Vowels

When a dependent vowel occurs with a consonant, only the dependent marking is required and the vowel sound is pronounced after the consonant to which it is affixed, no matter where the marking occurs. For instance, the sihari, /ɪ/, is written before a given consonant, but is always pronounced after it. Also, as mentioned above, if a consonant occurs with no matra, the spoken form is pronounced with a following mukta, or schwa. Each dependent vowel affixes to either a consonant or to one of the independent vowels. If one of the matra is adjoined to an independent vowel, the pronunciation for the matra is to be used.

4.4. Tones in Punjabi.

As was discussed extensively in Chapter 3, although much previous research has noted the presence of lexical tone, the various publications have failed to establish the

pattern by which it is applied in the spoken language. Many sources recycle the same limited data set, which includes a handful of minimal pairs. Given that Punjabi has a high number of similar consonants, finding a reasonable number of true minimal pairs is a difficult task. As such, much of the data from the previous research, and also from this research, are near-minimal pairs. This section will include discussion of the data elicited for this research, which will be listed in Table 10. Many previous researchers have made the claim that falling tone in Punjabi follows the historically voiced aspirated plosives, however this research finds these earlier explanations to be incomplete and overly simplistic. To illustrate this point, the discussion below will include data that conforms to the above prescription, historically voiced aspirated consonants followed by vowels, which do not demonstrate the expected lexical tone. In the analysis chapter, these transcriptions will be supported by renderings of elicited audio files created using Praat. For the purpose of this research, neutral tones will remain unmarked, rising tones will be marked with (´) on the tone-bearing vowel, and falling tones will be marked with (`) on the tone-bearing vowel.

4.4.1. Rising Tone.

In order to examine tone in Punjabi, the first set of data presented will include each of the relevant consonant types in intervocalic environments. Data with historically aspirated consonant occurring word-medially is has not been included in previous research. The data below includes these consonant types and related consonant types occurring word-medially, and are organized according to historical classifications of voicing and aspiration. This data shows that when a historically voiced aspirate occurs

word-medially, rising tone occurs on the preceding vowel and falling tone occurs on the following vowel.

Voiceless Unaspirated	Voiceless Aspirated	Voiced Unaspirated	Voiced Aspirated
ਸਿੱਕਾ	ਸਿੱਖ	ਸਾਗ	ਸੁੰਘਣਾ
sikaa /sika/ 'coin'	sikha /sikʰə/ 'Sikh'	saag /sa:ga/ 'green vegetable'	suunghenhaa /súŋgə̀ə̀/ 'to smell'
ਮੇਚ	ਮਛੂਆ	ਮਾਂਜਣਾ	ਮਿੱਝ
mech /mejtʃə/ 'measurement'	machhuua /məʃuwa/ 'fisherman'	maandzanhaa /māndʒə̀ə̀/ 'to scrub'	midzh /médʒə̀/ 'marrow'
ਲਾਟ	ਲਾਠੀ	ਲਡਾਉਣਾ	ਮੋਢਾ
laat /laːtə/ 'flame, blaze'	laathii /laːtʰi/ 'club, stick'	ladaaunhaa /lədaũ̀ə̀/ 'to swing'	modhaa /módə̀/ 'shoulder'
ਮਤਾ	ਮਥਾ	ਮੰਦਾ	ਮਧੂ
mataa /məta/ 'resolution'	mathaa /mətʰa/ 'forehead'	mandaa /mənda/ 'dull, feeble'	madhuu /módù/ 'honey'
ਲੁਪਤ	ਸਿਫਤ	ਦਬੀਰ	ਲਭਣਾ
lopat /lopətə/ 'concealed'	siphat /sɪfətə/ 'praise'	dabir /dəbiːrə/ 'scribe'	labhanhaa /ləbʰə̀ə̀/ 'to search'

Table 10: Rising Tone

Historically Voiced Aspirates: ਘ ਙ ਢ ਧ ਭ

These data show the presence of rising and falling tones in Punjabi. These tones, and further discussion of the necessary environments, will be further analyzed below.

4.4.2. Falling Tone.

The presence of falling tone in Punjabi is already well documented. The question here, then, is in which phonetic environments can falling tone be expected to occur? The data provided by previous researchers include examples of accepted tone words, but this data also includes only environments that have vowels which have been classified in this research as being bimoraic. The data presented below includes word forms with both bimoraic and monomoraic vowel environments and shows that falling tone occurs only on bimoraic vowels when they occur immediately following a historically voiced aspirated consonant when that consonant occurs word-initially.

Bimoraic Vowels	Voiceless Unaspirated	Voiceless Aspirated	Voiced Unaspirated	Voiced Aspirated
/i/	ਕੀਰਤੀ kiiratii /kirət̪i/ 'glory'	ਖੀਰ khiir /kʰir/ 'rice pudding'	ਗੀਰਾ giigaa /giga/ 'innocent'	ਘੀਸੀ ghiiisii /kisi/ 'rubbing buttocks on ground'
/e/	ਚੇਚਕ chechak /tʃetʃəkə/ 'small pox'	ਛੇਕ chhek /ʃekə/ 'gap'	ਜੇਬ dzeb /dʒebə/ 'pocket'	ਝੇਲਣਾ dzhelanhaa /tʃʰeləṇə/ 'to endure'
/o/	ਟੋਕਰਾ tokaraa /təkəra/ 'large basket'	ਠੋਕਾ thokaa /tʰoka/ 'carpenter'	ਡੋਗਾ dongaa /dõṅga/ 'large canoe'	ਢੋਲਣ dholanh /dʰoləṇə/ 'sweetheart'
/ɔ/	ਤੌੜਾ taurhaa /t̪aʊɾa/ 'earthen pot'	ਥੌਹ thauh /t̪ʰaʊ/ 'memory'	ਦੌਲਤ daulat /d̪aʊlətə/ 'wealth'	ਧੌਲੇ dhaule /t̪ʰaʊlə/ 'white hair'
/u/	ਪੂਕ puuk /puˈkə/ 'whiff'	ਫੂਲੇ fuule /pʰule/ 'popcorn'	ਬੂਟਾ buutaa /buṭa/ 'herb'	ਭੂਰਾ bhuuraa /p̪ura/ 'brown, grey'

Table 11: Falling Tone

Historically Voiced Aspirates: ਘ ਝ ਢ ਧ ਢ

These data demonstrate a regular pattern of falling tone within the specific phonetic environment. Since the realization of the historically voiced aspirated consonants most closely resembles the voiceless unaspirated counterparts, it is in these pairs that the data will undergo closer examination in the analysis section below.

4.4.3. Neutral Tone.

This section will examine phonemic environments in which the historically aspirated consonants are followed by monomoraic vowels, in order to demonstrate a lack of the falling tone as proposed by previous research. The data in Table 12 will show that when monomoraic vowels follow word-initial historically voiced aspirates, no pitch contours are present on the following vowels.

	Voiceless Unaspirated	Voiceless Aspirated	Voiced Unaspirated	Voiced Aspirated
/a/	ਕਾਂ kaan kã 'crow'	ਖਾਕਾ khaakaa k ^h aka 'sketch'	ਗਾਬ gaab ga·bə 'mud, silt'	ਘਾਘ ghaagh k ^h a·g ^h ə 'shrewd'
/ɪ/	ਚਿਰਾਗ਼ chiraag tʃɪragə 'lamp'	ਛਿੱਲੜ chhilarh ʃɪləɾə 'skin, bark'	ਜਿਗਰਾ dzigaraa dʒɪgəɾa 'bravery'	ਝਿਜਕ dzhidzak tʃɪdʒəkə 'reluctance'
/ə/	!	ਠੰਡੀ thadhii tʰəndʱi 'cold, cool'	ਡੱਕਾ dakaa dəkə 'cork'	ਢੰਗੀ dhangii dəŋgi 'clever'
/a/	ਤਾਕੀ taakii tʰaki· 'window'	ਥਾਲੀ thaalii tʰali 'metal plate'	ਦਾਇਰਾ daairaa dʱajəɾa 'ring'	ਧਾਵਾ dhaavaa tʰava 'attack'
/ɛ, ʊ/	ਪੈਰਵੀ pervii pervi 'pursuit'	ਫੈਲਾਉ felaaui felau 'to spread'	ਬੈਠਣਾ bethanhaa bɛtəŋa 'to sit'	!

Table 12: Neutral Tone

Historically Voiced Aspirates: ਘ ਝ ਢ ਧ ਢ

It should be noted that the phonemes /ε/ and /ʊ/ were not well represented in the spoken language data. This could be due to the dialect of the informant. Pertinent to these data, though, is the fact that these phonemes, even in the complete data list, never occur with a historically voiced aspirated consonant. Once again, it could be due to a dialectal consideration, or it could be the result of a phonetic rule not under consideration here. As shown above, it is also clear that the consonants which are historically classified as voiced aspirates most closely resemble the voiceless unaspirated counterparts in their spoken form and so again, it is between these that a closer analysis will be drawn in the Analysis section below.

5.0. Analysis.

This chapter will include an analytical examination of the data elicited for this research, with specific emphasis on establishing a pattern for Punjabi tonemics. Recall that it has been shown that tone is only present when there is a historically voiced aspirate in the orthography. Distinctions will be made between monomoraic and bimoraic vowels throughout this chapter, however continuing discussion of the implications of these two vowel types will be discussed towards the end of the chapter.

5.1. Word-Medial Environments.

This section will phonetically examine the variably realized consonant class when it occurs intervocalically. This will include data for which the orthography indicates that the given consonant is word-final, as in the spoken language, such a circumstance would necessitate a schwa-insertion. For the sake of consistency, as many minimal and near-minimal pairs as possible will be included here for side-by-side examination.

As was discussed in Chapter 4, Punjabi has a complex system of stops, organized into classes with similar features, including place of articulation, voicing, and aspiration. One consonant class, which is historically categorized as voiced aspirates, has variable realizations in the spoken language with regard to voicing. For most places of articulation in Punjabi, a neutralization occurs wherein consonants in this class de-voice word-initially, but maintain voicing word-medially. Westbury and Keating (1986) discuss the naturalness of this phenomenon. For environments in which a stop occurs word-initially, the researchers state that the “articulatorily simple pause + stop + vowel string will plausibly be voiceless (and unaspirated)” (p. 154). This assertion is supported by the Punjabi data,

which show overall a de-voicing and de-aspiration of the historically voiced aspirated consonants when they occur word-initially. When a member of the historically voiced aspirated consonant class occurs in this environment, voicing and aspiration are lost.

5.1.1. Word-Medial Analysis.

As noted above in the Data chapter, the group of consonants historically classified as voiced aspirates often do not display these features in the spoken language. From the data in Table 8, it is clear that intervocalically, these consonants maintain their voicing, but do not display evidence of aspiration. There is, then, a collapse in the spoken forms for the voiced unaspirated and voiced aspirated consonants. The general pattern is provided below.

$$\begin{array}{c} C \\ \left[\begin{array}{l} +\text{voi} \\ +\text{s.g.} \end{array} \right] \end{array} \rightarrow [-\text{s.g.}] \quad / \quad \text{V_V}$$

This rule states that historically voiced aspirated consonants lose aspiration when they occur word-medially. The following data illustrate the activity of this rule for each place of articulation.

Velar	ਸੌਗਾਤ	ਸੁੰਘਣਾ
	saugaat	sunghanhaa
	/sɔɡatə/	/súŋgə̀ɳə/
	‘gift’	‘to smell’
Palatal	ਮਾਂਜਣਾ	ਮਾਂਝੀ
	mandzanhaa	mandzhii
	/mǎnzə̀ɳə/	/mǎ́nzì/
	‘to scrub’	‘boatsman’
Retroflex	ਲਡਾਉਣਾ	ਮੋਢਾ
	ladaunhaa	modhaa
	/ləɖə̀ɳə/	/móɖə̀/
	‘to swing’	‘shoulder’
Dental	ਮੰਦਾ	ਮਧੂ
	mandaa	madhuu
	/mənɖə̀/	/móɖù/
	‘dull, feeble’	‘honey’
Bilabial	ਲੰਬਾ	ਲਭਣਾ
	lambaa	labhanhaa
	/ləmbə̀/	/lə́bə̀ɳə/
	‘tall, long’	‘to search’

Table 12: Intervocalic Deaspiration

These data also show that for Punjabi, historically voiced aspirated consonants, meaning the Gurmukhi letters ਘ (kʰəgə), ਝ (tʰədʒə), ਢ (tʰəɖə), ਧ (tʰəɖə), ਭ (pʰəbə), trigger

tonal alternation: a vowel preceding one of these consonants will have rising tone and a vowel following will have falling tone. To illustrate these pitch contours, see Images 1 and 2 below, which are Praat renderings of the bilabial data presented above in Table 12.

Image 1 is a rendering of the first bilabial data item, which lacks tone contour and Image 2 is a rendering of the second bilabial data item, which shows both rising and falling tone contours.

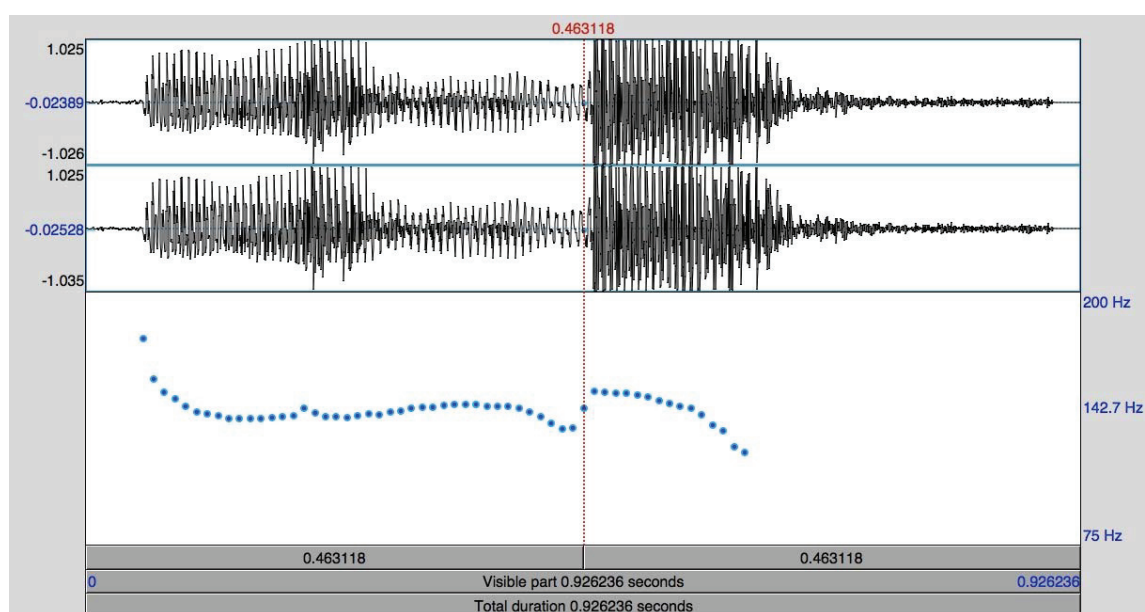


Image 1: /l ə m b a/

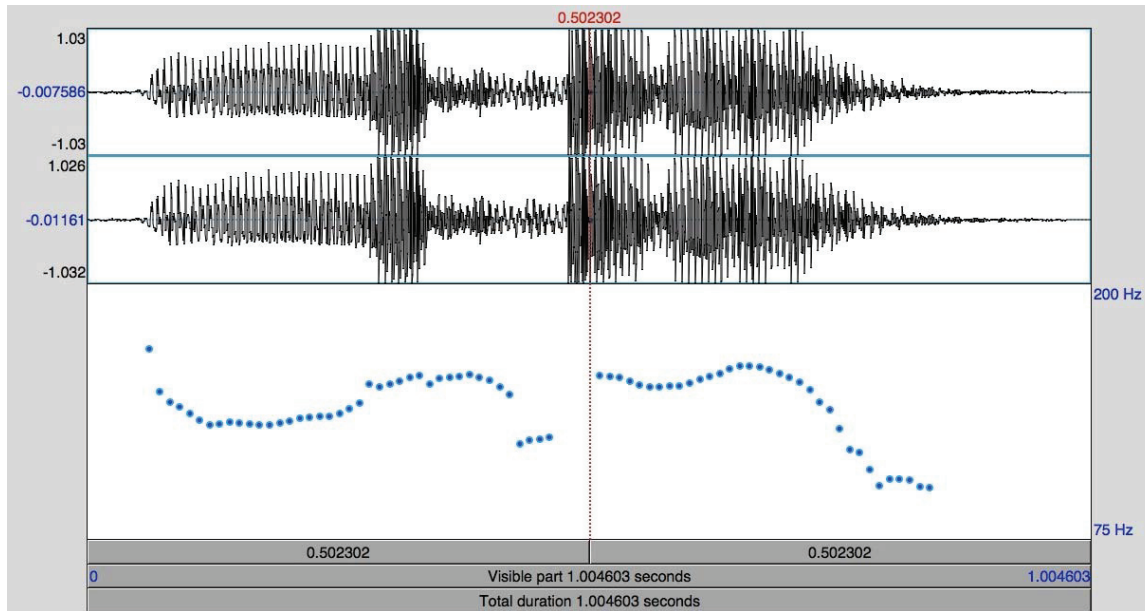


Image 2: /l é b ə ŋ a/

Notice that Image 2 shows significant pitch changes before and after the intervocalic /b/, whereas Image 1 shows neutral tone throughout the phonetic sequence, with only slight dip in pitch at the very end. This slight dip found in Image 1 represents the natural pitch changes of speech intonation, while the much more significant pitch changes displayed in Image 2 represent tone contours.

5.2. Word-Initial Environments.

This section will focus on the behavior of tones when the given consonant class occurs word-initially. Due to the tendency in this language to avoid consonant clusters, even across word boundaries, these consonants do not occur word-finally. The rule for schwa-insertion prevents this formation. Even in isolation, if a given word is spelled with a word-final consonant, it is pronounced with a schwa after said consonant.

5.2.1 Neutralization.

The data shown throughout section 5.1 demonstrates a neutralization between historically voiced aspirated and voiced unaspirated consonants with identical places of articulation when the given consonant occurs intervocalically. A similar phonemic collapse occurs when the consonants under consideration occur word-initially. From the data in Chapter 4 the following general pattern is established:

$$\begin{array}{c} \text{C} \\ \left[\begin{array}{c} +\text{voi} \\ +\text{s.g.} \end{array} \right] \end{array} \rightarrow \begin{array}{c} \text{C} \\ \left[\begin{array}{c} -\text{voi} \\ -\text{s.g.} \end{array} \right] \end{array} / \quad \#_V$$

This rule states that historically voiced aspirated consonants lose both voicing and aspiration when they occur word-initially. It is interesting that for this environment the given consonant loses both of the historically distinguishing articulatory features in the spoken form.

5.2.1.1. Refinement.

The rule above applies consistently and regularly to the velar, palatal, dental, and bilabial consonants in Punjabi, however the retroflex stops undergo a different phonetic neutralization. When these occur word-initially, the sound collapse is identical to that found in the intervocalic environments – the aspiration feature is lost, but voicing is retained. See below.

$$\begin{array}{c} \left[\begin{array}{c} \text{COR} \\ -\text{ant} \\ -\text{dist} \\ +\text{voi} \\ +\text{s.g.} \end{array} \right] \end{array} \rightarrow \begin{array}{c} [-\text{s.g.}] \end{array} / \quad \#_V$$

This difference in spoken representation of the retroflex consonants does not alter the tonal pattern, but is worth noting.

It is possible that the neutralization for the inter-vocalic consonants is due, at least in part, simply to their being intervocalic, meaning that Punjabi sound structure follows a common linguistic tendency for voicing consonants in that environment.

5.2.2. Word-Initial Analysis.

Having established the pattern of neutralization for words that have the complex consonants word-initially, attention will now turn to examining this environment for each place of articulation in order to establish a corresponding tonal pattern. Attention will also be paid to syllable weight.

5.2.2.1. Velar Stops.

For this data, recall that word-medially, the consonant with variable realization is pronounced /g/ and here the spoken form is /k/. For the purpose of consistency in the analysis, the vowels following the consonant in question will be /i/ or /ɪ/.

Form 1:

ਕੀਰਤੀ

kiiratii

/kirət̪i/

‘glory’

Form 2:

ਘੀਸੀ

ghiisii

/k̐isi/

‘rubbing buttocks on ground’

Form 3:

ਕਿਤਾਬ

kitaab

/kɪt̪abə/

‘book’

Form 4:

ਘਿੱਗੀ

ghigii

/kɪgi/

‘hiccup from weeping’

These data show that, for the given place of articulation, tone is only implemented after the variably realized consonant where the following vowel is bimoraic. This assertion is supported by the larger data sets found in Chapter 4. As shown above in the section in intervocalic environments, the vowel following the given consonant has falling tone.

5.2.2.2. Palatal Affricates.

For this place of articulation, both the voiceless unaspirated and the historically voiced aspirated consonants are represented as /tʃ/ in the spoken form. Again, for ease of comparison, the data considered will contain the vowels /i/ or /ɪ/.

Form 5:

ਚੀੜਾ

chiirhaa/

/tʃiɾa

'stiff'

Form 6:

ਝੀਲ

dzhiil

/tʃɪlə/

'lake'

Form 7:

ਚਿਰਾਗ਼

chiraag

/tʃɪragə/

'lamp'

Form 8:

ਝਿਜਕ

dzhidzak

/tʃɪdʒəkə/

'reluctance'

From this data it is again clear to see that, even given very similar phonetic environments, tone only occurs where the complex consonant is followed by a bimoraic vowel. The Praat renderings for Forms 5, 6, and 8 will be included here for further analysis, which will be presented as images 3, 4, and 5, respectively. Form 7 will not be included, as the voicing and aspiration collapse is established in the rendering for Form 5 (image 3) and the monomoraic/bimoraic vowel/tone difference is established with the rendering for Form 8 (image 5).

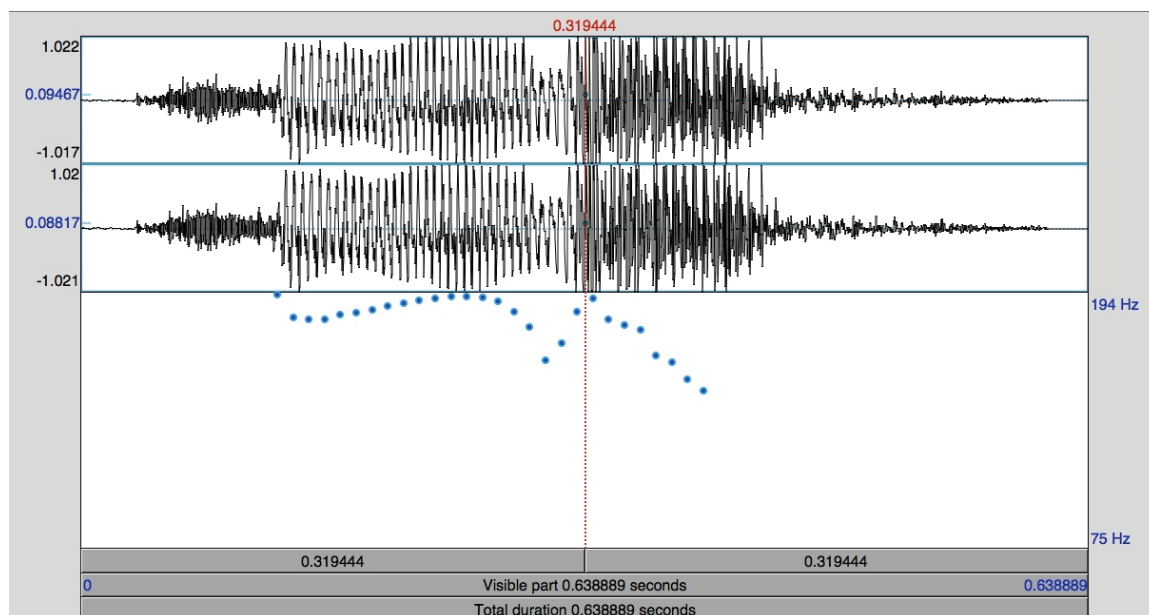


Image 3: /tʃ/ i a/

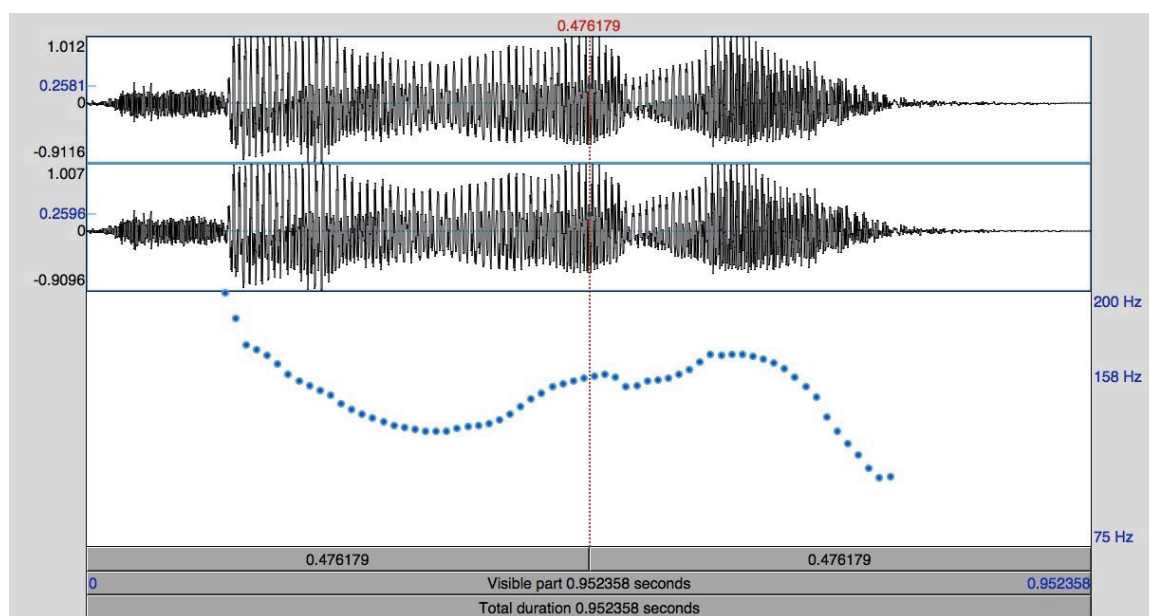


Image 4: /tʃ/ i l ə/

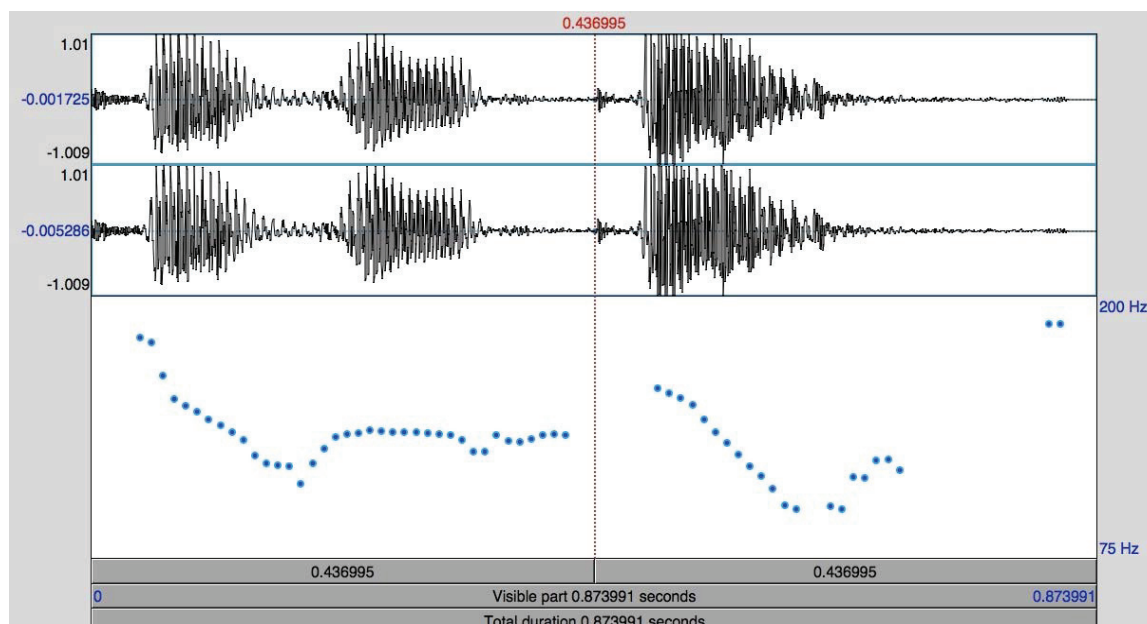


Image 5: /tʃ ɪ dʒ ə k ə/

These files show a neutral tone on the vowels for Images 3 and 5, and a clear falling tone on the vowel in Image 4.

5.2.2.3. Retroflex Stops.

Recall that for the retroflex point of articulation, the spoken form of the terms under consideration lose the [+sg] feature, but retain voicing, which is the same pattern established above in the section on intervocalic retroflex stops.

Form 9:

ਡੀਕ

diik

/d̪iːkə/

‘gulp’

Form 10:

ਢੀਠ

dhiith

/d̪iːtə/

‘obstinate’

Form 11:

ਡਿੱਗਾ

dingaa

/d̪iŋga/

‘curved’

Form 12:

ਢਿੱਗਾ

dhig

/d̪iɡə/

‘landslide’

Despite the difference in the voicing of the given consonant, when compared with those data discussed previously in this section, the pattern for tone remains constant. While the spoken forms for the two consonants are identical, tone is only found in the environment consisting of the variably realized consonant followed by a bimoraic vowel.

5.2.2.4. Dental Stops.

This place of articulation behaves in the general manner, regarding voicing and aspiration, established above. Examine the data below.

Form 13:

ਤੀਬਰ

tibar

/t̪ibərə/

‘sharp’

Form 14:

ਧੀਮਾ

dhiimaa

/t̪imã/

‘slow, gentle’

Form 15:

ਤਿੱਤਰ

titar

/t̪it̪ərə/

‘partridge’

Form 16:

!

The data for this place of articulation is consistent with the data above – tone occurs only in the prescribed environment, regardless of the pronunciation of the given consonants.

Unfortunately, there was no data elicited which would allow for a more regular comparison, meaning data with more closely relation phonemic environments. However, as this is a preliminary study, the data above is sufficient to propose the tonal pattern discussed.

5.2.2.5. Bilabial Stops.

The final environment under consideration is that with bilabial stops. It should be noted here that this place of articulation does not adhere fully to the voicing pattern discussed above. Rather, in the case of the historically voiced aspirated consonant, the voicing in the spoken forms alternate. As voicing has not been determined to have an effect on the presence or absence of tone in Punjabi, this voicing alternation will not be discussed further as it has no bearing on the current research.

Form 17:

ਪੀਲਾ

piilaa

/pila/

‘yellow, pale’

Form 18:

ਭੀੜਾ

bhiirhaa

/bɪɽa/

‘narrow’

Form 19:

ਪਿਘਲਣਾ

pighalanhaa

/pɪkəlɳa/

‘to melt’

Form 20:

ਭਿਖਾਰੀ

bhikhaarii

/pɪkʰari/

‘beggar’

These data show again that tone occurs where the variably realized consonant is followed by a bimoraic vowel and not when followed by a monomoraic vowel. It is worth noting that, regarding the voicing of the spoken form of the voiced bilabial aspirate, no pattern emerged regarding relationship between the spoken form and the features of the following vowels. Perhaps a regular pattern is in the process of being established, but as of the publishing date for this research, no such pattern has emerged.

5.2.3. Analysis of Tone Distribution.

Two patterns for distinctive tone in Punjabi have been proposed in this chapter, each with specific constraints. In a word-medial environment, rising tone occurs on vowels that precede members of the historically voiced aspirated consonant class, which is distinguished by its variable realizations, and falling tone occurs on vowels which follow members of this consonant class. These tones occur no matter the syllable weight of the vowels present. In the word-initial environment, falling tone is only found on bimoraic

vowels that immediately follow members of the historically voiced aspirated consonant class. These patterns hold true regardless of the spoken form of the consonant, meaning whether it is realized as voiced or voiceless in the spoken language. While there are few purely minimal pairs distinguished by tonal quality alone found in the language, the patterns indicate that tone in Punjabi is dependent on both the presence of a historically voiced aspirate, and also if that aspirate occurs word-initially, the syllable weight of the following vowel.

Recall that earlier research published on Punjabi tonemics included highly limited data sets, which consisted only of historically voiced aspirates in the word-initial position, followed in all cases by bimoraic vowels. This research finds that tone contours are indeed present in these data, but that given a broader data set, a more nuanced pattern of tone distribution emerges. It is critically necessary, when researching phonological elements of languages, to examine data representing a wide variety of environments so that patterns can naturally emerge. The rules governing Punjabi tone distribution presented here do not represent the expected pattern – syllable weight was not an initial consideration in this research, but the data collected showed clearly that morae hold a crucial element to the understanding of tone distribution in this language.

5.2.3.1. Tonogenesis.

The remainder of this chapter will briefly discuss a possible etymology for tone in Punjabi, with consideration given to the historical orthography. As discussed previously, it has been argued that the distinctive, lexical tone in Punjabi is a remnant of the once-present aspiration. This theory is supported by various researchers, including Gussenhoven (2004), Yip (2002), Shackle (1972), and Masica (1991). Recall also that the

second Sikh guru, Guru Angad Dev Ji, developed the Gurmukhi abugida in the 16th century to describe sounds as they existed in the spoken language at that time. Given that the orthography is otherwise organized by place of articulation, voicing, and aspiration, it is reasonable to surmise that at the time this abugida was established, the consonant class distinguished by the variable realizations discussed above bore aspiration in the spoken form and that the prescribed voicing was also accurate.

6. Conclusion.

The goal of this research was to uncover the systematic phonological rules which govern the application of lexical tones in spoken Punjabi. Tones have been a recognized feature of Punjabi since the 1926 publications of Bailey's "Notes on Panjabi Aspirates and Tones" and Das Jain's "Stress-Accent in Indo-Aryan." Still, little consensus has been reached among linguists and language researchers on this topic, even with regard to the number of tones, with claims ranging from two tones (Gleason and Gill, 1972) to four tones (Malik, 1995), although most research, including this research, argue for three distinct lexical tones (Shackle, 1972; Bahri, 1972; Tolstaya, 1981; Bahri, 1982; Campbell, 1991; Masica, 1991; Arun, 1997; Yip, 2003; Kalra and Purewal, 2007). Regarding the rules which govern tone patterns and behavior, there is equal disagreement among researchers, with varying claims stating that tone is related to syllable structure (Malik, 1995; Arun, 1997), that tone has no clear pattern and usage should be learned through mimicking native speakers (Kalra and Purewal, 2007; Gleason and Gill, 1972), that tone is a remnant of historically voiced aspirated consonants, which are no longer aspirated in their spoken form (Tolstaya, 1981; Masica, 1991; Fromkin, 1978; Campbell, 1991), or that a combination of syllable structure and historical aspiration is the key to Punjabi tone (Yip, 2003). For the many claims made, little substantive evidence is provided, and that which is discussed in the literature is problematic, as all of the vowels present in the earlier data were bimoraic and the data only considered historically voiced aspirated consonants where they occur word-initially.

This research makes three claims regarding lexical tone in spoken Punjabi: first, that tone is definitely related to the historically voiced aspirated consonant class; second, that when one of these consonants occurs word-medially, a vowel preceding a historically voiced aspirated consonant carries rising tone and a vowel following this consonant carries low tone; third, that where a historically voiced aspirate is word-initial, and is followed by a bimoraic vowel, this vowel will carry falling tone. Tone is shown to be predictable given an understanding of the orthography, but this is the only sure indication that has been established. When examining only the phonetic representations of lexical items, tone is not found to be predictable.

With these findings, it is possible to drastically improve Punjabi language learning materials and to help language learners better comprehend the spoken language and produce more native-like speech. An understanding of the basic patterns for lexical tone would assist many students of Punjabi from casual learners of the language to certain federal employees, including Punjabi language translators.

The data presented in this research is limited, as elicitations were conducted with one native, literate speaker of Indian Punjabi. The data presented also introduces interesting questions, which warrant further research. For example, if tone is related to historically aspirated consonants, as has been shown here to be the case, how are tones realized by non-literate speakers? How are tone patterns learned by children, and what do either of these things mean with regard to the mental representations of the lexical items which bear tones in native Punjabi speakers? It is possible that while tone is linked to historically voiced aspirated consonants, that this feature has become a pervasive element of spoken Punjabi and is acquired independent of knowledge of the orthography and

language history. As such, both children and non-literate speakers would be expected to demonstrate tone contours in their spoken language.

Spoken Punjabi also includes a large number of borrowed lexical items and it would be interesting to consider whether tone contours are realized in these items, and if so, discover how the tone features are governed in these environments. Future work in Punjabi linguistics is crucial to establishing the claims made here beyond doubt and also in answering the questions which have arisen due to the findings of this research. This work would ideally include native Punjabi speakers from throughout both the rural and urban Punjab region, both literate and non-literate, as well as native speakers from Pakistan and speakers of the closely related tonal languages Lahnda and Western Pahari, which are said to also be tonal and part of the Punjabi dialect continuum (Punjabi Language, 2012). Elicitations with literate Pakistani Punjabi speakers would necessitate the use of the Shahmukhi script and to discover whether historically aspirated consonants in this script also indicate tonal contrasts in the modern spoken language. Finally, as Punjabi is widely used in Pakistan as a lingua franca, it would be valuable to discover how local language learners who achieve functionality in the language implement the tonal contrasts.

References.

- Abugida. (2011) Retrieved 4/15/2011, from http://en.wikipedia.org/wiki/Abugida#Partial_list_of_abugidas
- Brahmic Scripts. (2012) Retrieved January 10, 2012, 2012, from http://en.wikipedia.org/wiki/Brahmic_scripts
- Chandigarh. (2012) Retrieved January 10, 2012, 2012, from <http://en.wikipedia.org/wiki/Chandigarh>
- Dogri-Kangri. (2011) Retrieved 4/21/2011, from http://en.wikipedia.org/wiki/Western_Pahari
- Gurdaspur district. (2011) Retrieved 27 October 2011, 2011, from http://en.wikipedia.org/wiki/Gurdaspur_district
- Gurmukhi Script. (2011) Retrieved 3/23/2011, 2011, from http://en.wikipedia.org/wiki/Gurmukhi_script
- Indo-Aryan Languages. (2012) Retrieved January 10, 2012, 2012, from http://en.wikipedia.org/wiki/Indo-Aryan_Languages
- International Phonetic Alphabet. (2011) Retrieved April 27, 2011, 2011, from <http://en.wikipedia.org/wiki/ipa>
- Lahnda languages. (2011) Retrieved 4/21/2011, from http://en.wikipedia.org/Lahnda_languages
- The Phonology of Tone*. (1993). New York: Mouton de Gruyter.
- Pradeep's Latest Punjabi English Dictionary. (2006). Jalandhar City, India: Pradeep Publishers.
- Punjab Region. (2011) Retrieved 4/15/2011, from http://en.wikipedia.org/wiki/Punjab_region
- Punjabi Language*. (2010). General Books, LLC.
- Punjabi Language. (2012) Retrieved 1/28/2011, 2012, from http://en.wikipedia.org/wiki/Punjabi_language

Punjabi Lanugage. (2009). Alphascript Publishing.

Shahmukhi Script. (2011) Retrieved 5/2/2011, 2011, from <http://en.wikipedia.org/wiki/Shahmukhi>

Teach Yourself. (2011) Retrieved April 27, 2011, 2011, from <http://www.teachyourself.com>

Teach Yourself. (2011) Retrieved April 27, 2011, 2011, from http://en.wikipedia.org/wiki/Teach_Yourself

Tone (Linguistics). (2011) Retrieved 4/15/2011, from [http://en.wikipedia.org/wiki/Tone_\(linguistics\)](http://en.wikipedia.org/wiki/Tone_(linguistics))

Abbi, A. (1985). Reduplicative Structures: A Phenomenon of the South Asian Linguistic Area. *Oceanic Linguistics Special Publications*, 20, 159-171.

Arun, V. B. (1997). *A Comparative Phonology of Hindi and Panjabi*. Patiala: Publication Bureau Punjabi University.

Bahl, K. C. (1957). Tones in Punjabi. *Indian Linguistics*, 17, 139-143.

Bahri, H. (1982). *Teach Yourself Punjabi*. Patiala: Punjabi University.

Bahri, U. S. (1972). *An Introductory Course in Spoken Punjabi*. New Delhi: Bahri Publications.

Bailey, T. G. (1926). Notes on Panjabi Aspirates and Tones. *Journal of the Royal Asiatic Society of Great Britain and Ireland*, 2, 299-301.

Bailey, T. G. (1929). The Meaning and Usage of Causal Verbs in Urdu and Panjabi. *Bulletin of the School of Oriental Studies, University of London*, 5(3), 519-522.

Bailey, T. G. (1929). Repetition of Words in Urdu, Hindi and Panjabi. *Bulletin of the School of Oriental Studies, University of London*, 5(3), 511-513.

Bhatia, T. K. (2000). *Punjabi: A cognitive-descriptive grammar*. Cornwall: Routledge.

Bloch, J. (1965). *Indo-Aryan: From the Vedas to Modern Times* (A. Master, Trans.). Paris: Librairie D'Amerique et d'Orient Adrien - Maisonneuve.

- Campbell, G. L. (1991). *Compendium of the World's Languages* (Vol. II: Maasai to Zuni). New York: Routledge.
- Das Jain, B. (1926). Stress-Accent in Indo-Aryan. *Bulletin of the School of Oriental Studies, University of London*, 4(2), 315-323.
- Dryer, M. S., M. H. (2011). World Atlas of Language Structures Online Retrieved 28 Jan 2012, 2012, from <http://wals.info/>
- Fromkin, V. A. (1978). *Tone: An Linguistic Survey*. New York: Academic Press.
- Ganathe, N. S. R. (2009). *Learn Punjabi in 30 Days*. Chennai: Balaji Publications.
- Gill, H. S. (1960). Panjabi Tonemics. *Anthropological Linguistics*, 2(6), 11-18.
- Gleason Jr., H. A., H. S. G. (1972). *A Start in Punjabi*. Patiala: Punjabi University Press.
- Goswami, K. K. (Ed.) (2010) Punjabi-English English-Punjabi Dictionary. New Delhi: USB Publisher's Distributors Pvt. Ltd.
- Grierson, G. (1918). Indo-Aryan Vernaculars. *Bulletin of the School of Oriental Studies, University of London*, 1(2), 47-81.
- Gussenhoven, C. (2004). *The Phonology of Tone and Intonation*. Cambridge: Cambridge University Press.
- House, D. (1990). *Tonal Perception in Speech*. Lund: Lund University Press.
- Hyman, L. M. (1985). *A Theory of Phonological Weight*. Dordrecht: Foris Publications.
- Kalra, S. S., N. K. P. (2007). *Teach Yourself Panjabi*. London: Hodder Education.
- Ladefoged, P. (1962). *Elements of Acoustic Phonetics*. Chicago: University of Chicago Press.
- Ladefoged, P. (1971). *Preliminaries to Linguistic Phonetics*. Chicago: University of Chicago Press.
- Ladefoged, P. (1975). *A Course in Phonetics*. New York: Harcourt Brace Javanovich, Inc.
- Ladefoged, P. (2003). *Phonetic Analysis: And Introduction to Fieldwork and Instrumental Techniques*. Cornwall: Blackwell Publishing.

- Ladefoged, P. (2005). *Vowels and Consonants*. Oxford: Blackwell Publishing.
- Ladefoged P., I. M. (1996). *The Sounds of the World's Languages*. Cambridge, MA: Blackwell Publishers Ltd.
- Laver, J. (1980). *The Phonetic Description of Voice Quality*. Cambridge: Cambridge University Press.
- Lieberman, P. (1977). *Speech Physiology and Acoustic Phonetics: An Introduction*. New York: Macmillan Publishing Co., Inc.
- Lieberman, P., S. E. B. (1988). *Speech Physiology, Speech Perception, and Acoustic Phonetics*. Cambridge: Cambridge University Press.
- Malik, A. N. (1995). *The Phonology and Morphology of Panjabi*. New Delhi: Munshiram Manoharlal Publishers Pvt. Ltd.
- Masica, C. P. (1991). *The Indo-Aryan Languages*. New York: Cambridge University Press.
- Mishra, M. (2004). *The Indus Aryans and the Vedic Culture*. New Delhi: Shipra Publications.
- Mohanan, K. P. (1986). *The Theory of Lexical Phonology*. Boston: D. Reidel Publishing Company.
- Payne, T. E. (2007). *Describing Morphosyntax*. New York: Cambridge University Press.
- Pike, K. L. (1948). *Tone Languages*. Ann Arbor: University of Michigan Press.
- Pike, K. L. (1956). *Tone Languages*. Ann Arbor: University of Michigan Press.
- Pulleyblank, D. (1986). *Tone in Lexical Phonology*. Boston: D. Reidel Publishing Company.
- Saran, S. (1969). *India's National Writing*. Delhi: Munshiram Manoharlal.
- Shackle, C. S. (2003). Panjabi. In G. C. a. D. Jain (Ed.), *The Indo-Aryan Languages* (pp. 581-621). New York: Routledge.
- Shackle, C. S. (1972). *Teach Yourself Punjabi*. London: The English Universities Press Ltd.
- Tisdall, W. (1961). *Punjabi Grammar*. New York: Frederick Ungar Publishing Co.

- Tolstaya, N. I. (1981). *The Panjabi Language: A Descriptive Grammar* (G. L. Campbell, Trans.). London: Routledge & Kegan Paul.
- Turner, R. L. (1967). Geminates after Long Vowel in Indo-Aryan. *Bulletin of the School of Oriental and African Studies, University of London*, 30(1), 73-82.
- Turner, R. L. (1970). Early Shortening of Geminates with Compensatory Lengthening in Indo-Aryan. *Bulletin of the School of Oriental and African Studies, University of London*, 33(1), 171-178.
- van der Hulst, H., K. S. (1993). *The Phonology of Tone: The Representation of Tonal Register*. New York: Mouton de Gruyter.
- Wali, K. (1980). Oblique Causee and the Passive Explanation. *Linguistic Inquiry*, 11(1), 258-260.
- Westbury, J. R., P. A. K. (1986). On the Naturalness of Stop Consonant Voicing. *Journal of Linguistics*, 22(1), 145-166.
- Yip, M. J. W. (2002). *Tone*. New York: Cambridge University Press.

Appendix A: Informed Consent

Consent Form for Research Subjects Participating in Panjabi Language Study

Introduction: The purpose of this study is to examine tone contours in the Panjabi language. All subjects are invited to participate in this research. You have been chosen to participate because you have identified yourself as a native speaker of Panjabi who is also literate in the Gurmukhi script. This study will be performed by Andrea L. Bowden, a graduate student in the Linguistics and English Language Department at Brigham Young University.

Procedures: For this study, participants will be asked to read 650 words written in Gurmukhi and repeat each word 2-3 times. This will be recorded using a digital voice recorder. The duration of the study will require 5-10 sessions of 1-2 hours each, with breaks as needed. Location and time of sessions will be at the participant's discretion.

Risks: There are minimal risks associated with participation in this research.

Benefits: There are minimal benefits to individual participants who agree to participate in this research. However, such participation could lead to a better understanding of Panjabi, which has been classified as a critical language by the US State Department.

Confidentiality: Personal or otherwise identifying information will remain confidential and data collected will be reported as group, and therefore not traceable to any specific participant, unless a given participant agrees to be identified. At the completion of the research, the data will be published as a Master's Thesis. I will maintain possession of the transcription notes and audio files indefinitely. The audio files and transcription notes will be stored on my personal computer. No personal information will be attached to these files. In all notes and published materials, participants will be referred to by an alphanumeric designation.

Compensation: There is no compensation offered in exchange for participation in this study.

Participation: Participation in this research study is voluntary. You have the right to withdraw at any time or refuse to participate entirely.

Questions about Research: You have the right to contact the researcher with any questions or concerns you may have during the course your participation in this research.

Principal Investigator:
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If you have questions about your rights as a research participant you may contact:

IRB Administrator
Brigham Young University
A-285 ASB Campus Drive
Provo, UT 84602
(801) 422-1461
irb@byu.edu

I have read and understand this consent form and have received a copy for my own records and I agree to participate in this research.

Participant Name

Participant Signature

Date

Appendix B: Punjabi Language Study Information

This research was conducted partially in Chandigarh, India, the capital of the state of Punjab, and partially in Salt Lake City, Utah, with a native speaker of Indian Punjabi.

Scholarship/Critical Language.

In December 2009 I applied for, and was awarded, a scholarship to travel to Punjab for 10 weeks during the summer of 2010 for the purpose of studying the Punjabi language and learning to read and write in Gurmukhi. This was the Critical Language Scholarship Program, which is overseen by the United States Department of State and the Bureau of Educational and Cultural Affairs. In this year, scholarships were awarded for students to study thirteen different languages, each classified as “critical” by the State Department, meaning it had been deemed important that more Americans become familiar with certain languages. These languages included Punjabi, Hindi, Arabic, Persian, and Russian, among others. Each year scholarships are awarded to well-qualified students enrolled in either undergraduate or graduate programs in the United States. The year of my award, a total of five hundred twenty-five students were awarded these scholarships to study thirteen different languages in more than twenty different countries. The Punjabi language program for 2010 lasted from the beginning of June to the end of August and took place in Chandigarh, Punjab, India.

Program.

The Punjabi language program in India was overseen by the American Institute for Indian Studies. A total of fourteen students were accepted into this program, ten of whom

received scholarships through the Critical Language Scholarship Program, and the remaining students had applied to AIIS directly and were self-funded. The CLS scholarship funded transportation costs to Washington DC for pre-departure orientation, and from there to our language study location. Additionally, the scholarship provided housing and board with a native Punjabi-speaking host family, transportation to and from language classes every day, funded trips to significant historical locations in Punjab, and provided a stipend for incidentals.

In school, students were divided into separate groups, depending on their level of proficiency already attained. I took Beginning Punjabi classes in the following subjects: reading, listening comprehension, grammar, dictation, conversational skills, vocabulary, and error correction, among others. For each of the ten weeks of the program, lessons were organized around a particular topic, such as shopping, hobbies, or holidays. Each day consisted of four one-hour classes, beginning at 8:00am and lasting until noon, with a short break at 10:00am. All of the teachers at the school were native speakers of Punjabi and used the language with the students almost exclusively. Our host families were also directed to speak exclusively to us in our target language. After our classes were completed, lunch was served at the school, followed by private tutorials. Each week each student would attend a one-hour-long private tutorial session with one of the teachers, which could focus on any area of interest or struggle for the given student. Weekly exams were conducted, in addition to comprehensive midterm and final examinations, the latter of which included an oral presentation.

After classes and tutorials were concluded each day, the students were at liberty and encouraged to explore the city, take lessons in dance or drumming, or any other

activity that would encourage the development of the target language and understanding of the local culture. As a woman, this was sometimes difficult to accomplish, as it is inappropriate in the culture for a woman to approach a man and initiate conversation. The women in the program were discouraged from travelling in the city alone, and especially from travelling after dark, for our safety. We were also sometimes thwarted in our efforts, as local Punjabis were often eager to practice their English skills with us.

Discovery of Tone Pattern.

As is usual with native speakers of a language, there was no instruction given in classes regarding the form and placement of lexical tone in spoken Punjabi, as the speakers themselves are not consciously aware of the tone behavior. As was mentioned above, the Punjabi language teachers, and other Punjabi speakers I met with, were easily able to point out errors in my speech production, but were not able to provide instruction on how to correct the errors. Similarly, for words that contain lexical tone, speakers were able to identify production errors, but could not explain why non-tonal production was incorrect.

My initial hypothesis formed during a private tutorial. I was scoring poorly in my dictation classes, as I could not hear a difference between certain similar sounds, when not given in isolation. In order to remedy this, I requested that one tutorial be dedicated to this topic. I asked my tutor to say two words together: one each containing an aspirated and an unaspirated consonant for each point of articulation and each voicing feature. In creating environments sharing most features, I was quickly able to recognize that the difference between the historically aspirated and unaspirated consonants was not determined by historical aspiration indicated in the voiced consonants, but rather in tonal alterations on surrounding vowels. In the unvoiced consonant pairs, the difference in spoken

representation was in aspiration. Unfortunately, this discovery was made very near the end of the program, but with this initial realization, I prepared to conduct more focused elicitations once I returned from India.

It is the focused purpose of this study to explore the number and pattern of tones that exist in Punjabi today with reference to how the tones relate to the Gurmukhi abugida. It should be noted here that there is some disparity regarding the appropriate English spelling of the language in question, with some scholars preferring the spelling “Panjabi” and others preferring the spelling “Punjabi.” This is likely due to the spelling in the language, which is ਪੰਜਾਬੀ. As has been explained above in the section focusing on the Gurmukhi script, there is no vowel explicitly indicated in the orthography between the /p/ (ਪ) and the /dʒ/ (ਜ). The superscript on the word, called the *tipi*, indicates nasalization (ਪੰ), but not any particular vowel. The Gurmukhi script is genetically related to the Brahmic scripts, from which it deviated in the 16th century by way of the Sharada script variation. In the Brahmic scripts, consonants carry an implicit vowel, and where no specific vowel is indicated in the script, a schwa is to be understood. As English orthography has no definitive symbol to indicate a schwa, there cannot be a standardized English spelling for this word. For the purposes of this paper, spellings used in book titles and quotations by specific authors will be retained, however the author of this paper will use the spelling “Punjabi,” which is to be pronounced /pənzabi/.

Appendix C: Gurmukhi Script

	Voiceless Unaspirated	Voiceless Aspirated	Voiced Unaspirated	Voiced Aspirated	Nasals	
	ੳ /u, ʊ, o/	ਅ /a, ɛ, ɔ/	ੲ /i, ɪ, e/	ਸ /s/	ਹ /h/	
Velar	ਕ /k/	ਖ /kʰ/	ਗ /g/	ਘ /gʰ/	ਙ /ŋ/	
Palatal	ਚ /tʃ/	ਛ /tʃʰ/	ਜ /dʒ/	ਝ /dʒʰ/	ਞ /ɲ/	
Retroflex	ਟ /ʈ/	ਠ /ʈʰ/	ਡ /ɖ/	ਢ /ɖʰ/	ਣ /ɳ/	
Dental	ਤ /t̪/	ਥ /t̪ʰ/	ਦ /d̪/	ਧ /d̪ʰ/	ਨ /n/	
Labial	ਪ /p/	ਫ /pʰ/	ਬ /b/	ਭ /bʰ/	ਮ /m/	
	ਯ /j/	ਰ /r/	ਲ /l/	ਵ /ʋ/	ੜ /ɽ/	
Borrowed	ਸ਼ /ʃ/	ਖ਼ /x/	ਗ਼ /ɣ/	ਜ਼ /z, ʒ/	ਫ਼ /f/	ਲ਼ /ɭ/