Investigating Weight-Sensitive Stress in Disyllabic Words in Marathi and its Acoustic Correlates*

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Summary. Little of the literature on Marathi phonology addresses stress, and none of it systematically. The tentative accounts that do exist are contradictory in their descriptions (Pandharipande 1997, Dhongde & Wali 2009). This study investigates word-level stress in Modern Standard Marathi. The goals of the study are to determine whether stress is weight-sensitive, what constitutes light and heavy syllables, which vowels are short or long (i.e. light (µ) vs. heavy (µµ)) and, what the acoustic properties of stress are in Marathi. Findings from the study show that Marathi has weight-sensitive stress and that open syllables with a short vowel are light while closed syllables and open syllables with a long vowel are heavy. The leftmost eligible syllable receives stress and the vowels (/i/, /u/, /ə/) = µ whereas the vowels (/iː/, /uː/, /aː/, /oː/, /eː/) = µµ. Observations also show that intensity and duration seem to be the most prominent cues for stress in Marathi.

Keywords: stress, phonology, Marathi, weight

1 Introduction

This study investigates word-level stress in Marathi disyllabic words. The state of the art concerning phrase and word-level stress in Marathi is still at an early phase. There are a few qualitative descriptions on the topic (Dhongde and Wali, 2009; Pandharipande, 1997) but the descriptions mainly remain confusing or contradictory. This study aims at bringing a more concrete understanding and a more systematic account of word-level stress patterns in Standard Marathi through an experimental approach that includes auditory and spectral analyses. Assumptions based on the literature and from a previous pilot study are that there is word-level of stress in Marathi and that it is not contrastive. This study focuses on the relationship between word-level stress, syllable weight and syllable position in disyllabic words. The main research questions are as follows:
1) Which syllables attract stress in Marathi and is stress weight-sensitive?
2) If stress is weight-sensitive, then what constitutes heavy syllables?
3) What are the rules for assigning stress when syllables have equal weights?

Section 2 of the paper consists of background on Marathi phonology. Section 3 focuses on background concerning weight and stress theory. Section 4 consists of the first experiment which investigates stress in words with /ə/ only and in words with the vowels /ə, aː, oː, eː/. This section also provides a descriptive account of the acoustic correlates of stress in Marathi. Section 5 consists of Experiment II, which investigates the duration and weight contrasts for high vowels /i, iː/ and /u, uː/ in Marathi.

Results from the first experiment show that stress is attracted to heavy syllables and that stress is therefore a weight-sensitive phenomenon in Marathi. The findings indicate that Marathi follows the Latin weight distinction system and that Marathi follows a default-to-same side stress system.

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Results from the second experiment reveal that there is still a phonemic vowel length distinction between high vowels and that long high vowels attract stress whereas short high vowels do not. Conclusions from the second experiment indicate that in terms of metrical weight, there are five long vowels /i:, u:, a:, e:, o:/ and three short vowels /i, u, ə/.

2 Marathi Phonology

This section introduces the language and reviews its phonological system using the literature as well as feedback from Marathi speakers and the data collected for the study.

Marathi is one of the 22 official languages spoken in India (Kurian, Narayan, et al., 2011) and is the official language of the Maharashtra State (Dhongde and Wali 2009). Marathi is considered as one of the several Modern Indo-Aryan languages that descend from Proto Indo-Iranian. More specifically, it descends from Maharashtri, a Prakrit (Middle Indo-Aryan) language that descends from Old Indo-Aryan languages (Burrow, 2001; Dhongde and Wali, 2009). Because of its geographical position, Marathi has historically been influenced by other languages from the same family and by Dravidian languages. Standard Modern Marathi encompasses features and borrowings from the surrounding languages as well as Persian and English. Indo-Aryan features of the language are SOV word order, the gender and number systems as well as part of the lexicon. Some features inherited from Dravidian languages are quotative markers, a complex participle system and vast borrowings from Kannada and Telugu (Pandharipande 1997). Marathi has several dialects and styles. This study focuses on the spoken and colloquial style of Englishized Standard Modern Marathi by educated speakers.

2.1 Vowel inventory

Marathi has ten vowels and two diphthongs illustrated in **Figure 1**. There are two high front vowels /i, i:/ and two high back vowels /u, u:/ with length distinction. The question of length distinction for the four high vowels is tested in section 5. There are two high mid vowels, a front one /e:/ and a back one /o:/. There are two low mid vowels, a front one /æ/ and a back one /ɔ/. The length of these two vowels has not been investigated yet. There are also two central vowels, mid central /ə/ and low central /a:/. Vowels marked with an asterisk only occur in English borrowings among educated speakers who desire to maintain the English vowel quality in words such as 'doctor' /ˈdɔkʈəɹ/ or 'contract' /ˈkəntræʈ/[1].

	Front	Central	Back
High	i: i		u: u
High mid	e:	əi əu	o:
Mid		ə	
Low mid	æ*		ɔ*
Low		a:	

Figure 1: Marathi vowel chart

1 The stress patterns in all sections preceding the experiment are marked according to the findings of the study from sections 4 and 5.

The literature on Marathi phonology (Dhongde and Wali, 2009; Pandharipande, 1997) lists three vowel duration contrasts: /ə/ versus /aː/, /i/ versus /iː/ and, /u/ versus/uː/. However, the contrast between /aː/ and /ə/ is more accurately described as a vowel quality contrast than a vowel duration contrast. Vowel duration is represented in the orthography for /i, iː/ (1), /u, uː/ (2) and /ə, aː/ (3).

(1) पि /pi/; पी /piː/

(2) पु /pu/; पू /puː/

(3) प /pə/; पा /paː/

The status of vowel duration for the high vowels is unclear in Marathi. Even though there are minimal pairs that use the vowel duration contrast (5.1) it is unclear whether the vowel length contrast is just encoded in the orthography and the minimal pairs have become homophones or if the duration contrast is maintained and remains contrastive for educated speakers of Standard Marathi.

The literature on vowel duration in Marathi is contradictory and does not provide any experimental account on the topic. According to Pandharipande (1997), all vowels occur word initially, internally and finally. However, the author also contradictorily states that word-final short /i/ is replaced by long /iː/ in contemporary Marathi despite the orthography in the formal register of Sanskritized Marathi. Dhongde and Wali (2009) claim that vowel duration for /i, iː/ and /u, uː/ in Marathi is not phonemic but rather positionally determined. Vowels /i/ and /u/ are long word-finally in open or closed syllables and short otherwise. This therefore means that not all vowels can occur word initially, internally and finally.

Most words that contain short final /i/ in their orthography derive from Old Indo-Aryan and belong to a specific register. The frequency of occurrence of short /i/ and /u/ indicated by the orthography in word-final syllables is notably lower than /iː/ and /uː/. Similarly, there are very few polysyllabic tokens that contain a long /iː/ or /uː/ in the first syllable. Final lengthening of the high front vowel is therefore a rather isolated case. It could be that the orthography reflects the output of the phonological rule.

Following several interviews with educated naïve Marathi speakers who speak the standard dialect, I concluded that speakers of this sociolect are well aware of the durational difference between /i, iː, u, uː/. However, the fact that speakers are aware of the durational difference does not necessarily mean that duration is phonemic. Vowel duration contrast in Marathi was inherited from Old Indo-Aryan and preserving the length contrast is usually perceived as a sign of educated speech and higher caste. It is difficult to determine whether there is an actual phonemic distinction or whether naïve Marathi speakers claim that there is a vowel length contrast because it is indicated in the orthography and because they want to sound educated. In the context of this study, vowel duration is a key concept because it is directly related to the number of moras in the syllable (Hayes, 1995), which is used to measure syllable weight (section 3.1). I will therefore investigate vowel duration for /i, iː, u, uː/ in section 5 in order to test whether educated speakers still have the phonemic duration contrast for the high vowels. Note that I will not address the duration issue between vowels /ə/ and /aː/ because it is mostly a vowel quality and weight distinction rather than a strictly durational distinction.

2.2 Syllable Structure

The structure of the canonical syllable is (C)(C)(C)V(V)(C)[2]. Possible syllables in monosyllabic morphemes are listed in (4) (Dhongde and Wali 2009).

[2] Parentheses indicate optionality.

(4) V, VV, CV, CCV, CCCV, CVC, CVVC, CCVC, CCCVVC
(5) /stɾəiɳ/ 'suited to woman'; /ʃəs.tɾə/ 'weapons'

The word for 'suited to woman' in example (5) illustrates the maximum syllable CCCVVC[3] (Dhongde and Wali 2009). Pandharipande (1997) claims that syllabification in Marathi favors onsets and that single word internal consonants are assigned as onset of the following syllable. Consonant clusters are not allowed in coda position. Word final consonant clusters are therefore not allowed, except in borrowings from English such as 'silk' or 'test'. In word medial position, the first consonant of a cluster is assigned to the coda position of the preceding syllable and the rest of the cluster is assigned to the onset of the next syllable, as illustrated in (5) (Pandharipande 1997).

3 Background

The literature on Marathi phonetics and phonology does not provide detailed analyses of the stress patterns of Marathi. According to Pandharipande (1997), stress is one of the least investigated areas of Marathi phonology. Dhongde and Wali (2009) provide a survey of previous research on Marathi stress. The survey reports that most authors conclude that stress is not a prominent feature of Marathi and that there is very little research on the topic, mostly based on casual observations. Based on previous literature and a preliminary study consisting of interviews with several Marathi speakers (see 3.4), I conclude that stress does not have a distinctive lexical function. Marathi speakers seem to not be well aware of its patterns and yet mostly argue that words should be pronounced with a specific stress pattern. I first review syllable weight theory in section 3.1. Then I review the literature on stress patterns in Marathi in section 3.2, followed by the general acoustic correlates of stress in section 3.3. Finally, section 3.4 summarizes the results from preliminary interviews about Marathi stress patterns with Marathi speakers.

3.1 Syllable Weight

The relationship between weight and stress is well established (Hayes 1995). Since the goal of this study is to establish the phonological properties of stress in Marathi at the word level, I will investigate the weight properties of Marathi syllables and whether stress is a weight-sensitive phenomenon in Marathi. Stress rules can refer to the distinction between light and heavy syllables, in which case stress is a weight-sensitive phonological phenomenon. For weight-sensitive stress, heavy syllables tend to attract stress whereas light syllables tend to resist being stressed, and receive stress only in the absence of eligible heavy syllables. Weight criteria vary across languages and different languages treat different syllable types as light or heavy (Gordon, 2004; Hayes, 1995). Gordon (2002) provides a typology of classes of weight distinctions for stress, which have different criteria for light and heavy syllables. There are two common weight distinctions for stress across languages. The Latin weight system considers both open syllables with long vowels (CVV) and closed syllables (CVC) as heavy syllables whereas the Khalkha weight system treats CVV as heavy but not CVC (Gordon 2002). In the Latin weight systems heavy syllables are usually represented as CVX. A few languages consider CVV and closed syllables with sonorants ($CV_{[-syll, +son]}$)[4] as heavy. **Table 1** modified from Gordon (2004) illustrates the proportions of languages for the three weight criteria previously mentioned.

[3] For purposes of comparison with phonological work on weight and stress, I use VV to indicate long vowels and diphthongs rather than a sequence of two distinct vowels.

[4] Gordon (2004) uses the notation [+son] to designate nasals, liquids and glides. I will follow Hayes' (2009) notation [-syllabic, +sonorant], abbreviated as [-syll, + son]

Table 1: Weight criteria for stress

Criterion	Number of languages
CVV (only) heavy	35
CVX heavy	40
CVV, CV[+son] heavy	3

Other weight-distinction criteria consider vowel quality in addition to syllable structure. Among the vowel quality criteria the most common are vowel height and central vowels. The distinction between central vs. non-central vowels actually relies more on durational than qualitative differences; non-central vowels are heavier than central ones because they are typically longer. In the vowel height criterion system, low vowels are heavier than high vowels for similar duration reasons. Gordon (2002) also underlines that when languages have phonemic vowel length distinctions, vowel-quality cannot be the only weight-distinction criterion. In fact, in Gordon's (1999) survey, twenty-five out of twenty-eight languages that have weight distinctions between different vowel qualities do not have a phonemic vowel length contrast. Marathi inherited its vowel length contrast from Old Indo-Aryan. However, vowel duration is unclear in Standard Modern Marathi. It seems that /aː, iː, uː/ are long and that /ə, i, u/ are short. Given the literature on syllable weight and weight sensitive stress, I will hypothesize that Marathi weight distinction does not primarily rely on vowel quality and is more likely to follow one of the two most common weight distinction systems, that is, the Latin or the Khalkha system. Some languages treat weight as a binary distinction while others treat it as scalar. The most common three-way scalar distinction is CVV>CVC>CV. According to the literature on syllable weight, onsets almost universally have no effect on weight (Gordon, 2005)[5]. The present study will therefore exclude syllable onsets and strictly focus on rime-sensitive stress in order to investigate syllable weight in Marathi.

Pandharipande (1997) attempts to identify stress patterns in Marathi and looks at syllable weight and stress as weight-sensitive. She considers open syllables with a short vowel (CV) as light and open syllables with a long vowel (CVV) as well as closed syllables with a short vowel (CVC) as heavy syllables, which is the Latin weight distinction system. The author treats /iː, uː, aː, eː, oː/ as heavy and /i, u, ə/ as light.

3.2 Stress

Pandharipande (1997) provides a description of the stress patterns of Marathi that takes into account syllable weight and position. In disyllabic words if both syllables are heavy or both are light, the initial syllable receives stress. In disyllabic and trisyllabic words, if only one syllable is heavy, it receives stress. In trisyllabic words, if two or all syllables are heavy, the first heavy syllable carries stress.

Dhongde and Wali (2009) list several rules about the stress patterns summarized below.

a. In disyllabic words with all vowels being /ə/, the final open syllable containing /ə/ is never stressed. However, if the final syllable is closed but not the first syllable, the final syllable will carry the stress.

This means that according to Dhongde and Wali (2009), in this context at least, closed syllables attract stress.

b. In trisyllabic words with all vowels being /ə/, the first heavy syllable will carry stress. This suggests that stress seems to fall on the leftmost eligible syllable.

The remaining rules regarding the role of vowels in stress assignment are rather unclear.

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[5] Everett and Everett (1984) report that onsets seem to affect syllable weight in Pirahã. More recent literature also suggests that onsets play a role in syllable weight (McGarrity, 2014; Ryan, 2014)

c. The vowel /aː/ always attracts stress except in trisyllabic words which have a heavy syllable with a long vowel /iː/ or /uː/.

d. If the first syllable contains /eː/ or /oː/, /aː/ can be stressed or not. When /uː, iː, eː, oː/ are in the final syllable they carry the stress, except when the word also contains the vowel /aː/.

e. If any two of these four vowels /uː, iː, eː, oː/ occur consecutively in non word-initial position, the first of the two vowel is stressed.

f. In words that have more than one syllable with /aː/ and no other vowel than /ə/, the first syllable with the vowel /aː/ is stressed.

To summarize, /aː/ is heavier than /ə/, stress is assigned to the leftmost heavy syllable and if all syllables are light, stress falls on the initial syllable.

This account of stress is difficult to arrange into systematic rules. The main conclusions are that the first heavy syllable carries stress and that closed syllables attract stress and therefore seem to count as heavy syllables. This leads me to believe that stress in Marathi is a weight-sensitive phenomenon and that it seems to be also affected by syllable position. It seems that Dhongde and Wali (2009) consider the effect of vowel quality and duration in the Marathi weight distinction system but there seems to be no systematic rule.

Both sources have different approaches to describing the stress patterns of the language. On the one hand, Dhongde and Wali (2009) take into account syllable weight, position in the word, vowel quality and duration. There are therefore four factors that seem to contribute to the predictions of stress in Marathi. However, it remains unclear which factor overrules another and what happens when all syllables have the same weight. On the other hand, Pandharipande (1997) uses a more concise and systematic description of the stress patterns of Marathi by mainly relying on syllable weight and position, and does not mention vowel quality or weight. We therefore do not know if, all things being equal in terms of syllable characteristics, vowel quality can influence stress assignment.

Given both accounts, it seems that CV is light and that CVX is heavy since both long vowels and closed syllables seem to attract stress. We can also conclude that stress seems to fall on the left-most syllable among syllables equally eligible for stress. Given the literature on Marathi stress, weight-sensitive stress and syllable weight, I predict that vowel height is unlikely to play a major role in the Marathi weight distinction system. Since this is a preliminary study on Marathi stress and since there is little reliable information on the topic, I will first rule out the most unlikely outcomes and hypothesize that Marathi stress is weight sensitive and that the weight system has a binary weight distinction. I also hypothesize that stress follows the Latin weight distinction system where CVX count as heavy syllables and CV as light syllables. In addition, I will focus on rime-sensitive stress, that is, I will only look at the syllable rime and ignore syllable onsets.

3.3 Acoustic correlates of stress

The acoustic correlates of stress are language specific and usually depend on the phonological systems of the given language. That is, if a feature such as duration is used to mark a phonemic contrast such as vowel length, it is unlikely that duration will be used as a correlate of stress (Hayes 1995). Even though acoustic correlates of stress are language specific, they usually correspond to one or more of the four following features: fundamental frequency, intensity, duration and vowel quality (Hayes 1995, Gordon and Nafi 2012). There is very little information regarding the acoustic correlates of stress in Marathi. The tonic syllable containing /ə/ will exhibit greater length than in syllables with the same vowel but without stress. Length, pitch and sonority account for the perception of stress (Kelkar 1958, cited in Dhongde and Wali 2009). Therefore, in this experiment, I will look at the four features listed above in order to see what acoustic cues mark stress in Standard Marathi.

3.4 Preliminary study

A preliminary study on this topic consisted of interviews with 4 Marathi speakers, two males and two females, regarding their understanding of stress in their language. In order to elicit stress patterns, speakers were asked to put everyday words in carrier phrases where they could put the word in contrast focus. Speakers were also asked to utter the word loudly as if they were upset or talking to someone far away. In another task, speakers were asked to tap when uttering the word. The first step consisted of tapping at each syllable with their hands on a table for a word in isolation. The second step consisted of tapping only once per word when the word was in isolation or embedded in a sentence. The aim was to find out whether speakers tapped in a consistent manner for a specific syllable of the word. Seven disyllabic words were used for the preliminary interviews and words were chosen for their syllable structure. The conclusions form these interviews are that there is some degree of word-level stress, that stress is not contrastive and that speakers were mostly unaware of stress patterns of their language. However, the four speakers had the same answers across the seven words. Observations presented in **Table 2** from the preliminary interview generate the ground for hypothesizing that CVV and CVC syllables are heavy (words 4-7) and that stress seems to fall on the leftmost eligible syllable (words 1-3).

Table 2: Elicited stress patterns

Syllable structure	Transcription	English gloss
1. CVV.CVV	['maːtaː]	‘mom’
2. CVV.CVV	['taːɾeː]	‘star’
3. CVC.CVC	['vəɾdəɭ]	‘busy flow’
4. CV.CVC	[gə'wət]	‘grass’
5. CVC.CV	['dɾuːstʰə]	‘wicked person’
6. CVV.CV	['dzʰaːɖə]	‘trees’
7. CV.CVV	[pə'ɾiː]	‘manner’

4 Experiment I - Word-level stress and syllable weight

The first experiment focuses on word-level stress patterns in disyllabic words in Marathi. This experiment is divided into three parts. The two first parts test three hypotheses:

1) H_1: stress in Marathi is weight sensitive and therefore falls on heavy syllables.
2) H_2: heavy syllables in Marathi follow the Latin weight distinction system with CVX heavy and CV light.
3) H_3: stress falls on the leftmost eligible syllable.

Part I and II focus on different material: Part I focuses on disyllabic words containing the vowel schwa only and Part II focuses on a different set of disyllabic words which includes vowels /ə, aː, eː, oː/. The third part of the experiment investigates the acoustic cues of stress in Marathi and provides a qualitative account of the correlates of stress in the language.

4.1 Experiment I - methodology

SPEAKERS In this study, I focus on Modern Standard Marathi, i.e. the Pune dialect, spoken by educated Marathi females. The two reasons why this study only focuses on female speakers are because more females expressed interest in participating in the study and to control for gender when looking at acoustic properties such as pitch and vowel quality. The participants in the study are typical of most Indians; they are bilingual or multilingual. Most educated speakers whose native language is not Hindi speak Hindi in addition to their native language. If their native language differs from the official language of the state, speakers usually speak the official language as well.

Most educated speakers speak English in addition to other languages they know. Educated Marathi speakers in Maharashtra therefore usually speak at least three languages. If their dialect is non-standard, speakers usually speak the local dialect in intragroup communication, that is, at home, with family and with friends. Speakers usually speak the Standard dialect in interdialectal communication.

The two speakers[6] for this experiment are educated adult females who speak Marathi natively and on a daily basis (**Table 3**). Both speak the standard dialect.

Table 3: Speakers metadata

Speaker	Gender	Age	Native language	Residency	Born	State where grew up	Degree
F02	female	51	Marathi	India	Pune, Maharashtra	Maharashtra	MA
F03	female	50	Marathi	US	Mumbai, Maharashtra	Maharashtra	MA

PROCEDURE This experiment consists of a reading task using a wordlist. This study only uses 2 tasks but speakers were presented with five tasks. All tasks were presented in different random orders to the subjects to prevent confounding or priming effects between the tasks. One other Marathi speaker was consulted to create the wordlists in order to make sure the language used in the tasks was correct, and that no taboo words were used. Two other Marathi speakers who did not take part in the experiment then reviewed the tasks before they were finalized.

The wordlist was chosen as the format to present material for this experiment because it allows a first level analysis with more control than other more complex tasks. One of the main advantages of wordlists to investigate stress is that words in isolation are not affected by phrasal or contextual prosodic features. Since this is a first attempt at analyzing word level stress in Marathi, it is important to first look at the word level without any other influence. Another advantage is that we can have several repetitions of the same words so that results can be averaged across different tokens of the words to generate more consistent observations and exclude outlier tokens. Other advantages are the fact that each set of repetitions can be presented in random order to prevent priming and memory effects. A disadvantage of wordlists however is that items can be pronounced differently across repetitions, creating variability in the data. Another disadvantage is that tokens are affected by the so-called wordlist intonation. In order to reduce this effect, filler and distracter tokens are added at the beginning, middle and the end of the wordlist. Material for the wordlists was extracted from reference grammars, dictionaries or news stories on the web. Words were chosen for specific linguistic features depending on the wordlist set and not for their meaning. This wordlist elicits different syllable structures with different positions in order to look at the correlation between syllable weight and stress. Due to the early status of analysis on this topic in Marathi and the number of factors that need to be controlled for when dealing with stress and syllable weight, I will limit my analysis to disyllabic words.

Speakers were recorded in a sound-attenuated booth at the University of Washington in Seattle with head-mounted AKG C520 condenser microphones. An XLR cable connected them to a separate channel in an M-Audio Profire 610 mixer outside the booth. Recordings were saved as 16-bit stereo WAV-file at a 44.1 kHz sampling rate. These recordings are high quality recordings and the use of head-mounted microphones allows controlling for acoustic intensity and improve signal-to-noise ratio.

[6] There were initially three speakers but data from the first speaker was not analyzed due to experimental mishaps.

MEASUREMENTS Two types of analyses were conducted to annotate the stress patterns of the 70 tokens. The first consisted of an auditory analysis. Each token was listened to in a quiet environment several times in a row, on two different days, to transcribe the stress patterns. Stress transcription results were compared and there was no discrepancy between the two transcriptions. The second analysis consisted of inspecting a spectrogram with a pitch track and intensity track accompanied by a waveform with an analysis window of 1 second in Praat (Boersma and Weenink, 2015). Waveforms were used to look at the amplitude and overall duration of the syllable. Spectrograms with pitch and intensity tracks were used to look at the average pitch of the syllable, pitch contours, overall syllable duration, vowel duration[7] and intensity.

4.2 Experiment I Part I - disyllabic words with schwa (CəCə)

In this section of the study, I focus on words with the vowel schwa only in order to remove the vowel duration/weight factor. The first part of this experiment therefore concentrates on syllable position and structure (open versus closed) to test whether stress is weight sensitive in Marathi. Material for Part I consists of 12 disyllabic words with the vowel schwa, extracted from the wordlist for Experiment I. Words consist of four structures: two open syllables (Cə.Cə), open initial and closed final syllables with an obstruent (Cə.Cə[-son]), open initial and closed final with a nasal, glide or liquid (Cə.Cə[-syll, +son]) and vice versa (Cə[-syll, +son].Cə). This is not a fully crossed designed because it was not possible to find words for all structures[8]. Similarly, word categories do not have the same number of words because it was difficult to find words with final schwa that had the correct structure. Each of the four structures however allows answering a specific question and the order in which they were analyzed allows adding one factor at a time. The reason why structures were separated between glides, liquids and nasals on one side and obstruents on the other side is to look at the less common weight criterion that counts CV[+son] as heavy syllables (see **Table 1**) .

Analysis for Part I was conducted on a total of 12 words presented to each speaker. Words were repeated three times in a random order, leading to a total of 70 tokens. Note that two tokens were excluded because of recording issues (e.g. coughing, word improperly read, etc.).

4.3 Experiment I Part I – results

Results from the auditory transcriptions and the spectral analyses were consistent when compared to each other. **Table 4** displays for each category and word the percentages of stress falling on the leftmost eligible syllable as predicted by the hypothesis. Since all vowels are schwa in Part I, only CəC can be heavy. In the 1st, 2nd and 4th categories, stress always falls on the predicted syllable, which is the initial syllable for the 1st and 4th categories and the final syllable for the 2nd category. In the 3rd category, stress falls 89% of the time on the predicted syllable which is the final syllable.

[7] Even though it was previously mentioned in section 3.3 that if a feature like duration is used to mark a phonemic contrast such as vowel length, it is unlikely that duration will be used as a correlate of stress (Hayes 1995), I decided to look at duration as an acoustic correlate of stress because it was one of the most salient cues for stress during the interviews.

[8] CVC.CVC words were not included because it was more difficult to find words of this structure without retroflex or aspirated consonants, which made stress harder to hear. In addition, speakers tended to disagree more for this type of tokens. Since this is a first experimental study on stress, conflicting structures were excluded.

Table 4: Percent of predicted stress per category and per token

Syllable type	% of predicted stress
1) Cə.Cə	100%
[ˈbəɾə]	100%
[ˈtəsə]	100%
[ˈkʰəɾə]	100%
2) Cə.Cə[-son]	100%
[pəˈdək]	100%
[pəˈdəʃ]	100%
3) Cə.Cə[-syll, +son]	89%
[pəˈtʃən]	100%
[gəˈgən]	83%
[kəˈʋən]	100%
[kəˈɖəɳ]	67%
[gəˈdzəɾ],[gəˈzəɾ],[gəˈdʒəɾ]	83%
[bəˈkəɾ]	100%
4) Cə[-syll, +son].Cə	100%
[ˈgənzə]	100%

4.4 Experiment I Part I - discussion

Overall results from both the auditory and spectral analyses indicate that stress tends to fall on the predicted syllable. When all syllables are light (Cə), as in category 1, stress falls reliably on the leftmost syllable of the word. When the syllables are unequal in weight (Cə[-son], Cə[-syll, +son], Cə), as in categories 2-4, stress is attracted to the heavy syllable (Cə[-son], Cə[-syll, +son]). We can deduce from the comparison between categories 1 and categories 2-4 that syllable weight seems to overrule syllable position since stress falls on the closed syllable as opposed to falling on just the initial syllable. Results from category 3 corroborate results from the 2nd category and indicate that closed syllables with a nasal, glide, liquid or obstruent seem to follow the same weight hierarchy, that is, CV[-son]/CV[-syll, +son] heavier than CV. I will therefore refer to CV[-son]/CV[-syll, +son] as CVC. Finally, results from the 4th category indicate that if the first syllable is heavier than the second syllable, stress falls on the first syllable, which confirms that stress is attracted by heavy syllables. Results for the first part of this experiment lead to several conclusions. First of all, stress correlates with syllable weight, which confirms the first hypothesis that stress is weight-sensitive in Marathi. In disyllabic words with only schwa, stress falls on the leftmost eligible syllable. Note that the word 'leftmost' is used here to account for longer words, which according to the preliminary experiment seem to follow the same patterns.

Another finding from this first part of the experiment is that the syllable weight factor overrules the syllable position factor. The second part of Experiment I introduces the third factor, vowel duration, which affects syllable weight.

4.5 Experiment I Part II – disyllabic words with /ə, aː, oː, eː/

This section focuses on how the three factors of vowel duration, syllable structure and syllable position affect stress. As previously mentioned in the background section (3.1), syllables with short vowels are lighter than syllables with long vowels. Marathi is documented as a language having long and short vowels. Since the length contrast is not entirely clear for the four high vowels /i, iː, u, uː/, the second part of the experiment only includes the vowels /ə, aː, oː, eː/. We previously saw in

Part I that /ə/ is considered as having one mora, which makes open syllables with schwa light syllables. We also previously saw that there is a length and quality contrast between the low front vowel /aː/ and the mid central vowel /ə/, which is evidence that /aː/ can be considered as a long vowel for purposes of syllable weight. In addition, we also saw in the literature that Pandharipande (1997) counts vowels /aː, eː, oː/ as long, that is, as two mora vowels, and /ə/ as short, that is, as a one mora vowel. Vowels /eː, oː/ come from the fusion or monophthongization of diphthongs /ai/ and /au/ respectively in Old Indo-Aryan. Both diphthongs constituted two moras and yielded the long vowels /eː, oː/ (Schane, 1984). Note that it is possible that the short vowel version of /eː/ and /oː/ have collapsed to /ə/, which would make /ə/ the short version of /aː, eː, oː/.

Material for this experiment consists of 205 disyllabic words across speakers, divided into eleven categories (see **Table 5** for details on the number of tokens and the Appendix to see the entire wordlist). Certain categories of words have an odd number of tokens because a token was excluded for the analysis if it was corrupted by paralinguistic or technical issues. The tokens contain the vowels /ə, aː, oː, eː/ and are all extracted from the same word list as Part I. Auditory and acoustic analyses were conducted in the same way as Part I. Most word structures have a different amount of tokens due to the amount of available words per given structure. Tokens only containing the vowel schwa from the first part of the experiment were also included in this section is order to have a broader picture of the stress patterns across vowels /ə, aː, oː, eː/. Note that closed syllables with a nasal, glide or liquid (CV[-syll, +son]) were grouped together with other consonants under the label CVC because they behave like CV[-son] syllables in terms of weight.

4.6 Experiment I Part II – results

Results for both the acoustic and auditory analyses show very high percentages of stressed syllables consistent with the predictions of our hypothesis. **Table 5** summarizes the percentages of predicted stressed syllables for 11 word structures in the 205 words across both speakers. Stress predictions for word structures 1-3 are on the final syllable and percentages of correct predictions range from 92% to 100%. In these three categories, the final syllable is always heavier than the first syllable. The first open syllable with a schwa (Cə) is lighter than the final closed syllables with schwa (CəC) or a long vowel (CVVC) and lighter than open syllables with a long vowel (CVV). These results indicate that stress falls on the heavy syllable. For structures 4-11, stress is predicted to fall on the first syllable and correctly does so 100% of the time except for category 10, where stress falls 95% of the time on the heavy syllable. In categories 4 and 6, both syllables have the same structure and the same vowel, which means that in this case stress is influenced by the position factor. 100% of the words in categories 4 and 6 have word initial stress, which means that stress falls on the leftmost syllable.

Table 5: Percentages of predicted syllables stressed

Category number	Word structure	Syllable stressed	% of predicted stress	Total number of tokens
1	Cə.CəC	Final	98%	44
2	Cə.CVV	Final	92%	12
3	Cə.CVVC	Final	100%	12
4	Cə.Cə	Initial	100%	18
5	CəC.Cə	Initial	100%	5
6	CVV.CVV	Initial	100%	10
7	CVVC.CVV	Initial	100%	6
8	CVV.CVVC	Initial	100%	18
9	CVV.Cə	Initial	100%	15
10	CəC.CVV	Initial	95%	22
11	CVV.CəC	Initial	100%	43

4.7 Experiment I Part II – discussion

Results from categories 7 and 8 indicate that CVV and CVVC are equally heavy because if CVVC were to be heavier than CVV, stress would have shifted to the final syllable in category 8. Similarly, categories 10 and 11 indicate that CVV and CVC have the same weight, otherwise stress would have shifted between both categories. In addition, we previously saw in Part I of Experiment I that final consonants are not extrametrical in all-schwa words, where final syllables can attract stress. Results indicate that Cə is light and that CVV, CVVC and CəC are heavy. We also saw that /ə/ counts as a short vowel, which means that if Cə is light then CV is probably light. We can therefore conclude from these results that CVX syllables are heavy and CV syllables are light in Marathi. The language therefore follows the Latin weight distinction criteria. We can also conclude that stress falls on the left eligible syllable when other factors are equal. Finally, we can conclude that stress correlates with syllable weight in Marathi and therefore, stress can be considered as a weight-sensitive phonological phenomenon in the language.

4.8 Experiment I Part III – Acoustic correlates of stress

This section is a brief and qualitative overview of the possible acoustic correlates of stress in Marathi. **Figure 2** and **Figure 3** illustrate acoustic correlates of stress for two words. **Figure 2** shows word-initial stress for the word /ˈbərə/, ‘okay’. Duration of the stressed syllable is 252ms out of the 497ms word, or about 50% of the word. We can also observe that intensity and pitch are slightly higher on the stressed syllable than on the unstressed one. **Figure 3** illustrates word final stress for the word /pəˈdəʃ/ ‘gradually’. In this word, the first syllable is unstressed and represents a smaller percentage of the word duration. Duration of the initial unstressed syllable is 171ms as opposed to 416ms for the final stressed syllable. The initial unstressed syllable therefore represents 29% of the total word duration whereas the final stressed syllable represents 71% of the word duration. This finding needs to be corroborated by further research because other factors such as phrase final lengthening or the number of segments in the word are also responsible for longer durations of the final syllable. Pitch and intensity are again slightly higher on the stressed syllable than on the unstressed one.

One of the main acoustic observations regarding stressed syllables in disyllabic words in Marathi is that they are on average longer than unstressed syllables. Intensity also seems to be a cue for stress in Marathi since stressed syllables are on average slightly louder than unstressed syllables. In the data collected and analyzed for this study, words are not marked with pitch contours. Stressed syllables however always seem to have a pitch that is either similar to the unstressed vowel or higher.

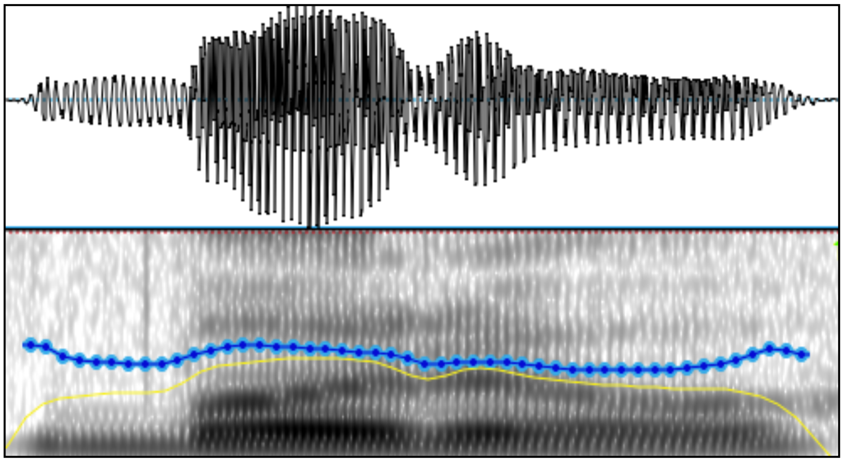

Figure 2: Waveform and spectrogram of the word /ˈbərə/ 'ok', window of 1sec in Praat, pitch track in blue, intensity track in yellow

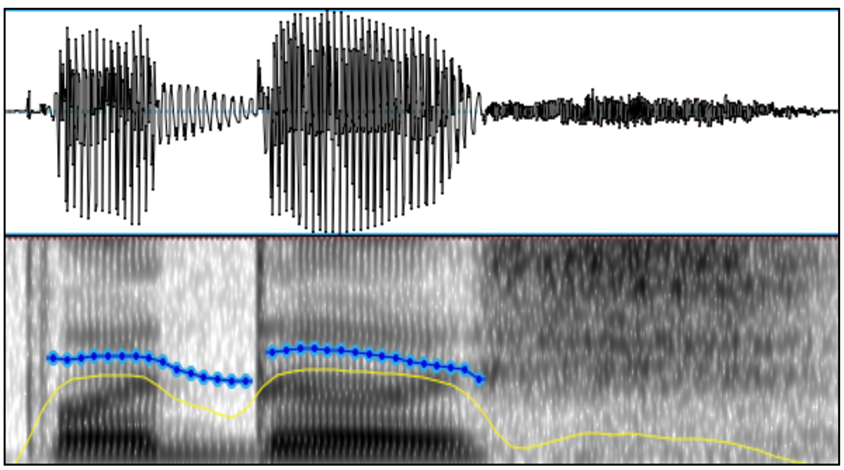

Figure 3: Waveform and spectrogram of the word /pəˈdəʃ/ 'gradually', window of 1sec in Praat, pitch track in blue, intensity track in yellow

5 Experiment II - Vowel duration

The aim of this experiment is to find out whether vowel duration is contrastive in Marathi and whether there is a weight distinction between long and short high vowels. This experiment is divided into two parts. The first part exclusively focuses on three minimal pairs in order to establish whether there is a phonemic duration contrast between short and long high vowels. In the second part, 7 words containing all types of vowels are analyzed in order to test whether long high vowels attract stress. The two hypotheses are as follows:

1) H_1: there is a vowel duration contrast for high vowels /i, iː, u, uː/ in educated speakers of Standard Marathi.

2) H_2: long high vowels are heavy and short high vowels are light.

5.1 Experiment II - methodology

SPEAKERS The same set of speakers participated in Experiments I and II.
PROCEDURE Same experiment procedure for Experiments I and II.
MATERIAL As reviewed in Keating (1985), vowel duration is affected by a variety of factors. Syllable position in the word affects duration because vowels in word-final syllables tend to be lengthened. The number of syllables per word also affects vowel duration because the greater the number of syllables per word, the shorter each vowel is. Syllable structure also affects duration; vowels in closed syllables are shorter than in those in open syllables. Duration is also affected by phonetic context such as neighboring consonants and vowel height (low vowels tend to be longer than high vowels). Words chosen for this study were controlled for these factors as much as possible, but because of the limitations of Marathi phonotactics, all factors could not be controlled. Only the number of syllables per word and syllable structure and position were controlled. Material for Experiment II was extracted from the first wordlist as well as from a separate wordlist designed to look at durational contrast in monosyllabic, disyllabic and trisyllabic words containing the vowels /i/ and /iː/ or /u/ and /uː/. A total of 88 tokens are analyzed in this experiment. Due to the various factors that affect vowel duration, I restricted the tokens to two monosyllabic minimal pairs from the wordlist for the first part of the experiment. Each word is repeated 3 times by each speaker, which leads to 24 tokens in total. Minimal pairs allow controlling for neighboring environment and the number of moras in the word. Monosyllabic words allow controlling for the location of stress. The minimal pairs chosen are /ʃiɾ/ 'to enter, head' versus /ʃiːɾ/ 'vein' and /kutʃ/ 'woman's breast' versus /kuːtʃ/ 'to march'. Short and long vowels are predicted by the orthography.

The existence of such minimal pairs should indicate that there is a duration contrast between the high vowels but it is actually unclear whether the duration contrast indicated by the orthography is maintained by the speakers or if the minimal pairs have evolved into homophones.

MEASUREMENTS Vowel duration was measured from the waveform, with a spectrogram for reference, with a window of 1 second using Praat. If the vowel onset or offset was unclear, the vowel boundary was identified by a marked drop in intensity in the waveform and on the intensity track of the spectrogram together with a loss of energy in the higher formants and the appearance of aperiodicity in the waveform.

5.2 Experiment II Part I – results

Duration results for the two minimal pairs across the two speakers show that there is some level of durational contrast. **Table 6** lists duration and ratio values for the high back vowels /u/ and /uː/ and **Table 7** lists the same information for /i/ and /iː/. The first column of both tables gives duration values for short vowels and the second column gives duration values for long vowels. Finally, the third column lists ratios of short to long vowels, that is, how much longer the long vowel is compared to the short vowel. Values were not normalized across speakers because the ratios act as normalization. Average vowel durations for high back vowels /u, uː/ are 156ms for short vowels and 174ms for long vowels with an average ratio of 1:1.26. Note that the second token for /u/ (280ms) is more than two standard deviations from the median (133ms) and can therefore be considered as an outlier. The last row of **Table 6** reports the trimmed average. This mean excludes the outlier token for short /u/ and a random token for long /uː/. The trimmed mean ratio of long to short high back vowels is 1:1.40. Average vowel durations for /i/ versus /iː/ are 145ms for short vowels and 238ms for long vowels with an average long to short vowel ratio of 1:1.69. Results for these two minimal pairs indicate that high short vowels are indeed shorter than long vowels.

Table 6: Vowel duration and short to long vowel ratios for /u/ and /uː/

	[kutʃ]	[kuːtʃ]	ratio
CVC mono-syllabic duration (ms)	146	149	1:1.02
	280	151	1:0.54
	170	206	1:1.21
	120	172	1:1.43
	108	213	1:1.97
	113	155	1:1.37
Mean	156 ms	174 ms	1:1.26
Median	133 ms	164 ms	1:1.29
Trimmed Mean	131 ms	179 ms	1:1.40

Table 7: Vowel duration and short to long vowel ratios for /i/ and /iː/

	[ʃiɾ]	[ʃiːɾ]	ratio
CVC mono-syllabic duration (ms)	105	245	1:2.33
	129	213	1:1.65
	146	241	1:1.65
	138	229	1:1.66
	158	236	1:1.49
	194	261	1:1.35
Mean	145 ms	238 ms	1:1.69
Median	142 ms	239 ms	1:1.65

5.3 Experiment II Part I - discussion

In perception, category boundaries for short and long vowels usually differ across languages. Lehnert-LeHouillier (2010) shows that there is a significant effect for language on vowel length category boundaries for German and Japanese speakers for the same stimulus set. Studies on vowel duration ratios in production also show a higher ratio of vowels for Japanese than for German vowels. Ratios for Japanese range from 1:2.4 to 1:3.2 (Hirata and Tsukada, 2009) whereas it is 1:2.3 for German vowels (Lehnert-LeHouillier, 2010). There is a range of 1:2.5 to 1:2.74 for Thai vowels (Rosner and Pickering, 1994). In (Lehnert-LeHouillier 2010), Japanese listeners judged the vowel duration cutoff to be later than the German listeners. That is, for Japanese speakers, the difference between short and long vowels is located closer to the long end of the continuum, which is probably linked to the fact that vowel duration ratios are higher in Japanese than in German. This can be interpreted to mean that short to long vowel duration ratios are not universal and that there is no absolute cutoff value. However, under ratios of 1:1.3, the duration difference becomes perceptually too small to make a difference. Average ratios of vowels across the 22 tokens (2 tokens excluded to remove the outlier) in this study range from 1:1.40 to 1:1.69. Even though these ratios are smaller than the ratios mentioned above for Japanese, Thai and German, they are still above the limit of perceptible vowel duration.

5.4 Experiment II Part II

In the second part of this experiment, material consists of 8 disyllabic and 3 trisyllabic words containing long and short high vowels as well as other vowels. Each word was repeated 3 times by each speaker, which makes 6 repetitions of each word across the two speakers, except for the words for 'sewing' [ˈsiːʋən] and for 'sweet potato plant' [ˈɾaːtaːɭiː], which only have 5 repetitions because one of the tokens for each word was corrupted by paralinguistic noise. This leads to a total of 47 disyllabic words and 17 trisyllabic words.

5.5 Experiment II Part II – results

Given the duration results from the previous experiment, it seems that short /i, u/ are indeed shorter than their long counterparts. This supports the idea that short high vowels have a single mora and will count as light in an open syllable and that long high vowels have two moras and will count as heavy in open syllables. In order to test this hypothesis, a comparison was made between 8 disyllabic words and 41 tokens containing long and short high vowels as well as other vowels, to verify whether stress is attracted to long high vowels /iː, uː/. If stress is indeed attracted to syllables containing long high vowels and not to short high vowels, we can confirm that /iː, uː/ are treated as heavy and that /i, u/ are treated as light.

Table 8: Stress patterns for disyllabic words with all types of vowels

word transcription	syllable structure	English gloss	% of predicted stress	syllable position	total number of tokens
[ˈkəpi]	CV.CV	ape	66%	initial	6
[ˈtəɾu]	CV.CV	tree	100%	initial	6
[ˈsiːʋən]	CVV.CVC	sewing	100%	initial	5
[piˈtaː]	CV.CVV	father	100%	final	6
[tiˈtsaː]	CV.CVV	hers	100%	final	6
[kiˈtaːb]	CV.CVVC	book	100%	final	6
[puˈɾaːɳ]	CV.CVVC	sacred composition	100%	final	6
[ˈpuːdʒək]	CVV.CVC	that worships	100%	initial	6

Results presented in **Table 8** indicate that for seven words out of eight, stress systematically falls on the predicted syllable – on the left most eligible syllable. These findings therefore indicate that stress falls on syllables containing long high vowels and that stress is not attracted to vowels containing short high vowels. The word for 'ape' however is interesting because the second speaker stressed the expected syllable (initial) on all three repetitions whereas the first speaker stressed the unexpected syllable (final) on two out of three repetitions. In cases where the final syllable was stressed, the duration ratio of initial to final syllables was lower (1:0.75 and 1:0.50) than the average ratio (1:0.78) (**Table 9**), which indicates that even if the orthography is not respected, it seems that vowel length and stress tend to correlate.

Table 9: Ratios of initial to final vowel duration in the word [ˈkəpi] ‘ape’ depending on where stress falls

word transcription	initial vowel duration (ms)	final vowel duration (ms)	initial to final ratio	speaker	syllable stressed
[ˈkəpi]	92	115	1:0.80	2	initial
[ˈkəpi]	91	145	1:0.63	2	initial
[ˈkəpi]	86	98	1:0.88	2	initial
[ˈkəpi]	79	72	1:1.10	1	initial
[kəˈpi]	81	108	1:0.75	1	final
[kəˈpi]	63	125	1:0.50	1	final
Average	82	110.5	1:0.78		

In addition to the 8 disyllabic words, I also added results for three trisyllabic words containing short and long vowels (**Table 10**). All 17 tokens indicate that stress falls on the first heavy syllable. In the first word, the initial syllable has a short /i/ and is therefore light. Stress falls on the second syllable, which is the leftmost heavy syllable. In the second and third words, stress falls on the heavy syllables. The wordlist does not contain any trisyllabic words with only light syllables. However, given the findings of this experiment, we can predict that the first light syllable would be stressed. In order to account for cases with all light syllables, it seems preferable to state that stress falls on the leftmost eligible syllable rather than on the first heavy syllable.

Table 10: Stress patterns in 3 trisyllabic words

word transcription	syllable structure	% of predicted stress	syllable position	total number of tokens	English gloss
[piˈpaːsaː]	CV.CVV.CVV	100%	medial	6	thirst
[ˈniːlimaː]	CVV.CV.CVV	100%	initial	6	blueness
[ˈɾaːtaːl̪iː]	CVV.CVV.CVV	100%	initial	5	sweet potato plant

5.6 Experiment II Part II – discussion

Figure 4 illustrates the acoustic properties of the disyllabic word [ˈsiːʊən] ‘sewing’, stressed on the first syllable. The structure of this word is CVV.CVC. The initial syllable is an open syllable with a long vowel (CVV) and the final syllable is a closed syllable with a short vowel (CVC).

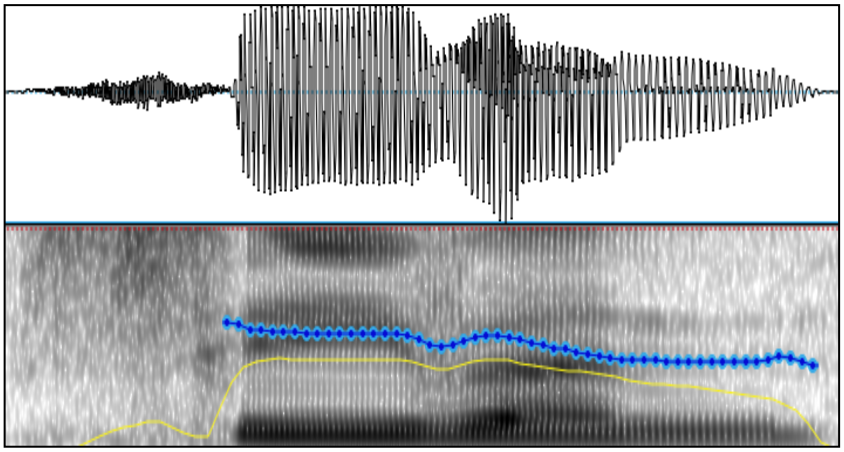

Figure 4: Waveform and spectrogram of the word [ˈsiːʋən] ‘sewing’, window of 1sec

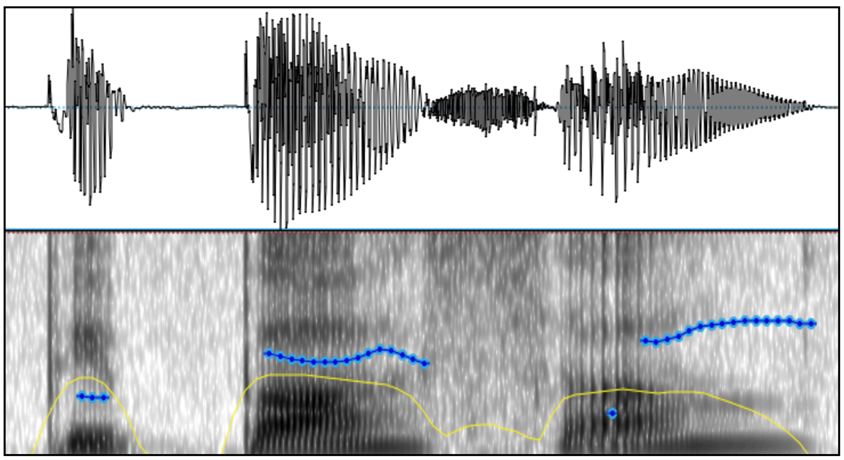

Figure 5: Waveform and spectrogram of the word [piˈpaːsaː] ‘thirst’, window of 1sec

Figure 5 illustrates the acoustic properties of the trisyllabic word [piˈpaːsaː] ‘thirst’, stressed on the medial syllable. The first syllable is light (CV) and the second and last syllables are heavy (CVV). We concluded from the previous experiments that CVX is heavy in Marathi and that stress falls on the leftmost eligible syllable. For ‘sewing’, since the final syllable is heavy, the only way that stress can fall on the first syllable is if the first syllable is heavy as well. For ‘thirst’, the fact that stress falls on the first heavy syllable and not on the word-initial syllable shows that short /i/ does not attract stress. The second part of this Experiment confirms that short high vowels are light and that long high vowels are heavy. Spectrographic inspection of the 58 tokens also confirms acoustic cues noted in the previous experiment. These observations also point toward the fact that vowel duration and intensity seem to be the acoustic correlates of stress in Marathi.

6 Conclusion

This paper tackles the issue of word-level stress in disyllabic words in Marathi. The first experiment shows that stress is a weight-sensitive phenomenon as stress is attracted to heavy syllables. Findings from the first experiment also show that stress falls on the leftmost eligible syllable and that Marathi weight distinction follows the Latin system where CVX syllables are heavy and CV syllables are light. These results corroborate findings from Dhongde and Wali (2009) and Pandharipande (1997). The second experiment reveals that there is still a phonemic vowel length distinction between high vowels and that long high vowels attract stress whereas short high vowels do not. To summarize, we found that there are five long vowels with more metrical weight /iː, uː, aː, eː, oː/ than the three short vowels which have less metrical weight /i, u, ə/. Both experiments confirm from qualitative measures that the main acoustic correlates of stress in Marathi seem to be vowel length, intensity and pitch. Note that even short vowels have lengthening in stressed syllables so even if stress is attracted to heavy syllables with long vowels stress can also lengthen short vowels.

Further research on the topic will focus on a wider variety of tokens with more syllables as well as words extended by affixes in order to investigate whether stress is sensitive to morphological components. In addition to words in isolation, further research will also look at word-level stress in different focus and topic positions in carrier sentences in order to see if word-level stress is affected by phrasal stress. Further research will also include more systematic and quantitative analysis of the acoustic correlates of word-level stress in Marathi.

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7 APPENDIX – Word list corresponding to Table 5 – Total of 205 tokens

Syllable Structure	Transcription	Stimuli	Syllable Structure	Transcription	Stimuli
Cə.Cə	[ˈkʰəɾə]	खरं	Cə.CVV	[gəˈdaː]	गदा
Cə.Cə	[ˈtəsə]	तसं	CVV.Cə	[ˈtʃaːkə]	चाकं
Cə.Cə	[ˈbəɾə]	बरं	CVV.Cə	[ˈmaːz̤ə]	माझं
Cə.CəC	[gəˈdzəɾ]	गजर	CVV.Cə	[ˈloːkə]	लोकं
Cə.CəC	[pəˈdək]	पदक	CəC.CVV	[ˈkəɭʋaː]	कळवा
Cə.CəC	[pəˈdəʃ]	पदश	CəC.CVV	[ˈgətʃkaː]	गचका
Cə.CəC	[bəˈkəɾ]	बकर	CəC.CVV	[ˈgəɾkaː]	गरका
Cə.CəC	[kəˈɖəɳ]	कडण	CəC.CVV	[ˈgəŋgaː]	गंगा
Cə.CəC	[kəˈʋən]	कवन	CVV.CəC	[ˈkaːgəd]	कागद
Cə.CəC	[gəˈgən]	गगन	CVV.CəC	[ˈkaːtəɾ]	कातर
Cə.CəC	[pəˈtʃən]	पचन	CVV.CəC	[ˈkeːsəɾ]	केसर
CəC.Cə	[ˈgənzə]	गंज	CVV.CəC	[ˈpaːdəp]	पादप
CVV.CVV	[ˈkaːkaː]	काका	CVV.CəC	[ˈkaːɾəɳ]	कारण
CVV.CVV	[ˈkoːɾaː]	कोरा	CVV.CəC	[ˈbeːgəm]	बेगम
CVV.CVV	[ˈtaːlaː]	ताला	CVV.CəC	[ˈtaːɾək]	तारक
CVVC.CVV	[ˈpaːɾʋaː]	पारवा	CVV.CəC	[ˈpaːdəp]	पादप
CVV.CVVC	[ˈbeːzaːɾ]	बेजार	CVV.CəC	[ˈbeːdəm]	बेदम
CVV.CVVC	[ˈpaːʂaːɳ]	पाषाण	Cə.CVVC	[pəˈsaːɾ]	पसार
Cə.CVV	[kəˈdaː]	कदा	Cə.CVVC	[bəˈdaːm]	बदाम