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Stress in Angkola Batak Language: An Acoustic Phonetic Approach

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ABSTRACT

The purpose of this study was to analyze the prosody of stress in declarative utterances of the Angkola Batak language using an acoustic phonetic approach. This research used an experimental phonetic approach, namely by performing manipulations aimed at determining the effects of manipulation on the observed behavior of individuals (Latipun, 2002). Experimental measurements of speech sounds were carried out using spectrum analysis using a computer. The recordings used came from a Sony ICD-PX 470 recorder in WAV format, and Praat software version 6.0.54 was used to analyze suprasegmental or prosodic features. The suprasegmental or prosodic features analyzed include pitch, intensity, and duration of speech. The results of this study showed that the stress position of declarative utterances in the Angkola Batak language was located at the beginning of the word or the first syllable. Like the word *mangan*, which consisted of two syllables, namely the words *ma* and *ngan*, the emphasis occured at the beginning of the word or the first syllable, namely *ma* with a frequency of 175.9 Hz, a duration of 0.582 seconds and an intensity of 73.99 decibels. Then the word *utte* which consisted of two syllables, namely the words *ut* and *te*, the emphasis occured at the beginning of the word or the first syllable, namely *ut* with a frequency of 323.6 Hz, a duration of 0.167 seconds and an intensity of 65.4 decibels. In addition, with the same findings in words consisting of three syllables, such as the word *mamasu*, which consisted of three syllables, namely the words *ma*, *ma* and *su*, the emphasis occured in the first syllable, namely *ma* with a frequency of 200.3 Hz, a duration of 0.198 seconds and an intensity of 72.65 decibels. The stress on the first syllable in declarative sentences was based on the high frequency value produced by Angkola Batak native speakers.

Keyword: Stress, Declarative Utterances, Angkola Batak Language, Acoustic Phonetics.

ABSTRAK

Tujuan dari penelitian ini adalah untuk menganalisis prosodi tekanan dalam ujaran deklaratif bahasa Batak Angkola dengan menggunakan pendekatan fonetik akustik. Penelitian ini menggunakan pendekatan fonetik eksperimental yaitu dengan melakukan manipulasi yang bertujuan menentukan efek manipulasi terhadap perilaku individu yang diamati (Latipun, 2002). Pengukuran eksperimental bunyi ujaran dilakukan dengan menggunakan analisis spektrum menggunakan komputer. Rekaman yang digunakan berasal dari perekam Sony ICD-PX 470 dalam format WAV, dan perangkat lunak Praat versi 6.0.54 digunakan untuk menganalisis fitur-fitur suprasegmental atau prosodi. Fitur-fitur suprasegmental atau prosodi yang dianalisis mencakup tinggi-rendahnya nada bunyi, intensitas, dan durasi penuturan bunyi. Hasil penelitian ini menunjukkan bahwa posisi tekanan ujaran deklaratif dalam Bahasa Batak Angkola terletak diawal kata atau suku kata pertama. Seperti kata mangan, yang terdiri atas dua suku kata yaitu kata ma dan ngan , penekanan terjadi diawal kata atau suku kata pertama yaitu ma dengan frekuensi 175.9 Hz, durasi selama 0.582 detik dan intensitas sebesar 73.99 desibel. Kemudian kata utte yang terdiri atas dua suku kata yaitu kata ut dan te, penekanan terjadi diawal kata atau suku kata pertama yaitu ut dengan frekuensi 323.6 Hz, durasi selama 0.167 detik dan intensitas sebesar 65.4 desibel. Disamping itu juga dengan hasil temuan yang sama pada

kata yang terdiri atas tiga suku kata, seperti kata mamasu , yang terdiri dari tiga suku kata yaitu kata ma,ma dan su, penekanan terjadi pada suku kata pertama yaitu ma dengan frekuensi 200.3 Hz, durasi selama 0.198 detik dan intensitas sebesar 72.65 desibel. Tekanan pada suku kata pertama dalam kalimat deklaratif didasarkan atas tingginya nilai frekuensi yang dihasilkan oleh penutur bahasa batak Angkola.
Keyword: Tekanan, Ujaran Deklaratif, Bahasa Batak Angkola, Fonetik Akustik.

1. Introduction

Systemic suprasegmentals consist of tone and intonation, and lexical stress. In the study of language structure, phonology is one of the important studies in understanding and studying the structure of a language (Syahputra et al., 2018). Phonology is a study that places language sounds as the object of study (Kridalaksana, 2011). The study of phonology itself is divided into phonetics and phonemics, and (Chaer, 2009) explains that phonetics is a branch of linguistic studies that examines the sounds of language without seeing whether these sounds distinguish meaning, while phonemics examines the sounds of language and pays attention to the function of these sounds as distinguishing meaning. (Odden, 2005) also added that phonemics refers to the sounds of a language, the rules for combining sounds, and the variety of articulation, while phonetics refers to the physical units of sound that can be measured and produced from the sounds of a language.
In addition, in the study of phonetics itself, there are several divisions of the field of study, namely acoustic, articulatory, and auditory phonetics (Chaer, 2009: 10).

This research will examine in depth the stress which is one of the suprasegmental elements in language. Therefore, this research can be categorized in the study of acoustic phonetics because it discusses the sound of language when it propagates in the air, including studying sound waves, frequency, and sound intensity (Chaer, 2009: 11). (Clark, 1991) divides two suprasegmental aspects, in the form of phonetic suprasegmental aspects and systemic suprasegmental aspects. Phonetic suprasegmental aspects consist of pitch, duration, and loudness or intensity, while phonetic suprasegmental aspects are considered important because they are indicators in measuring systemic suprasegmental aspects. So, it can be said that in order to measure both pitch and intonation, as well as stress, it is necessary to look at the movement of pitch, duration, and intensity of each segment in the utterance.

(Zsiga, 2013:354) defines stress as prominence in relation to syllables or syllables. Furthermore, it is also stated that stress is a matter of relative prominence. So, it can be said that the stress of a word can be measured when comparing syllables that are in the same lexeme neighborhood. (Ladefoged, 2011, p. 249) also explained that stressed syllables tend to be articulated with greater force compared to syllables that are not stressed and are more prominent in speech. In addition, (Clark, 1991, p. 280)) also reveal that for when there is prominence or emphasis on a particular syllable in the word, the more visible factor is the movement of pitch compared to duration and intensity.

Looking at the definition above, it can be said that this research aims to analyze and describe the prosody of stress in declarative speech of the Angkola Batak language using an acoustic phonetic approach. This can be done by measuring phonetic suprasegmental aspects, namely pitch, duration, and intensity in Angkola Batak speech data. The movement of these phonetic suprasegmental aspects can show how a syllable experiences emphasis or prominence and can be seen more clearly by using software, namely Praat, in analyzing stress in the Angkola Batak language.

2. Method

This research used an experimental phonetic approach, which was by performing manipulations aimed at determining the effects of manipulation on the observed behavior of individuals (Latipun, 2002). The experimental phonetic approach was used to record sounds, analyzed them acoustically, and described the sound shape in the form of spectrogram waves. The population studied consisted of adult males aged 25 to 30 years who were native speakers of the Angkola Batak language and live in the Padangsidempuan Hutaimbaru Region. The selection of the female gender was based on the findings found by (Kuswantari, T. D., Atusaadah, M. R., Syarfina, T., & Sitinjak, 2022) which explained that the value of sound frequency and sound intensity produced by women was higher than that produced by men. The sample for this study consisted of 5 female voices. Then, researchers collected speech data from Angkola Batak speakers in the Padangsidempuan Hutaimbaru area which, when viewed from the explanation of the previous section, is part of the Angkola Batak language speech area,

In this study, computer-aided spectrum analysis was used to measure speech sounds. Sound recordings were obtained using a Sony ICD-PX 470 recorder and saved in WAV file format. Praat software version 6.0.54

(Boersma, P., & Weenink, 2001) was used to analyze suprasegmental or prosodic features, such as frequency, intensity, and duration of speech sounds. Using Praat, an instrumental approach can be used to define the imaging technique, which involved tracking vocal fold motion and measuring acoustic properties. In addition, modifications were made to the pitch form and duration, including the alteration of high, low and flat tones. Time adjustments were made by shortening the duration in order to obtain the desired pitch as well as looking at the stress position in declarative utterances spoken by predetermined samples.

This study described speech sounds involved native speakers of the Angkola Batak language as a source of information. The data of this research consisted of 5 types of utterances produced by these speakers, namely declarative utterances. The examples of these utterances were *mangan utte au* which means "I eat orange", *kehe hami tu sikola* which means "we go to school", *marsiajar ia di medan* which means "He studies in Medan", *mamasu abit umak* which means "mother washes clothes" and *mardahan kakak di dapur* which means "the sisters cooks in the kitchen".

3. Result and Discussion

In the research that has been conducted, by analyzing phonetic data through Praat software, the results of data analysis in this study are presented in three components, namely frequency, duration, and sound intensity of the utterances spoken by the informants.

Frequency of Declarative Utterances by Angkola Batak Native Speakers

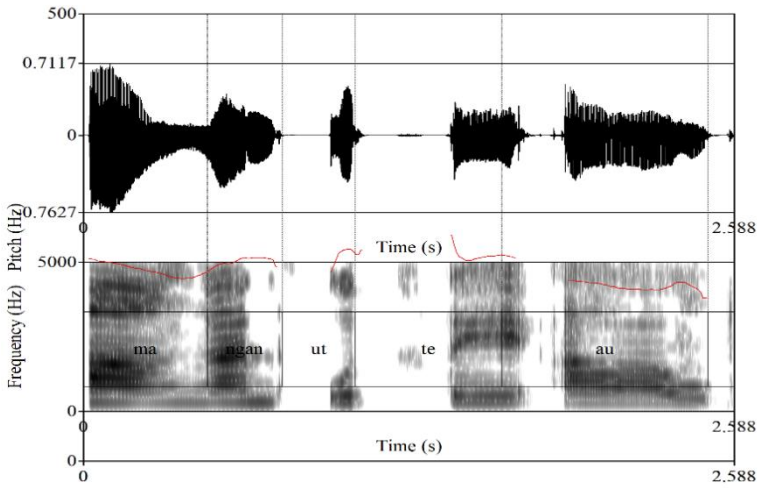

Figure 1. *mangan utte au* "I eat orange" Informant 1.

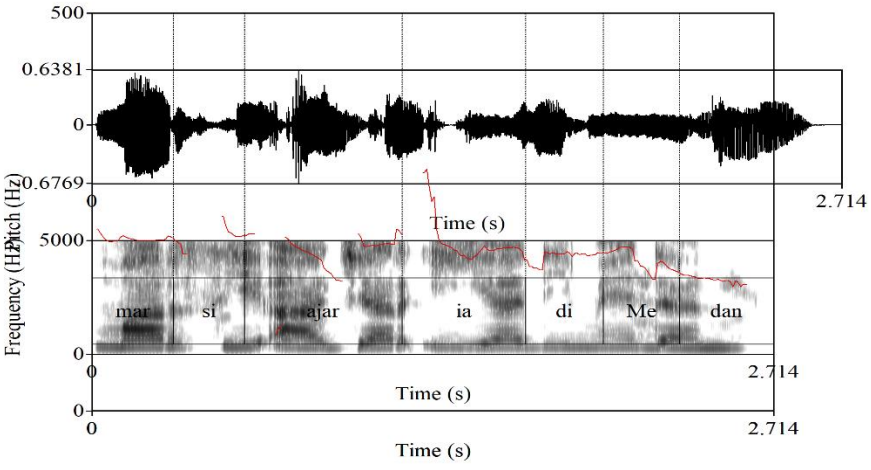

Figure 2. *kehe hami tu sikola* "we go to the school" Informant 2.

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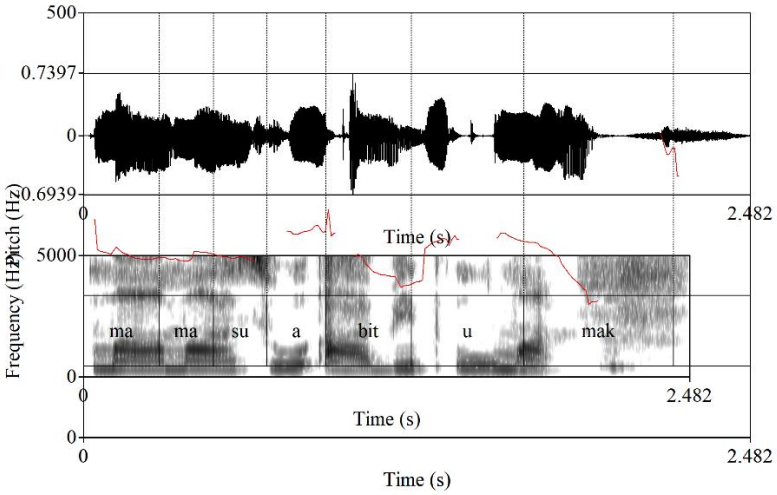

Figure 3. *marsiajar ia di Medan* "He studies in Medan" Informant 3.

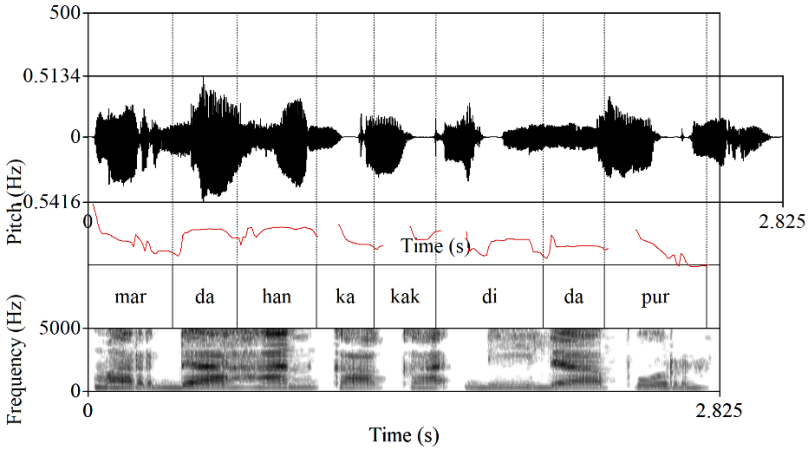

Figure 4. *mamasu abit umak* "mother washes clothes" Informant 4.

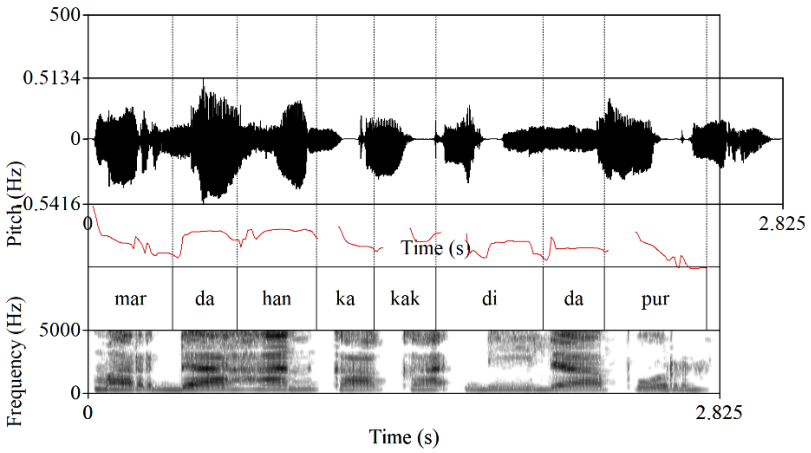

Figure 5. *mardahan kakak di dapur* "sister cooks in the kitchen" Informant 5.

Figure 1 above is an image of the results of the analysis using Praat. It can be seen that declarative sentences consisting of several syllables, such as the word *mangan*, which consists of two syllables, namely the words *ma* and *ngan*, in this case the emphasis occurs at the beginning of the word or the first syllable, namely *ma* with a frequency of 175.9 Hz, a duration of 0.582 seconds and an intensity of 73.99 decibels. Then the word *utte* which consists of two syllables, namely the words *u*t and *te*, can be clearly seen that the emphasis occurs at the beginning of the word or the first syllable, namely *ut* with a frequency of 323.6 Hz, a duration of 0.167 seconds and an intensity of 65.4 decibels. For the last word, *au* does not occur.

Figure 2 above is an image of the analysis results using Praat. It can be seen that declarative sentences consisting of several syllables, such as the word *kehe* which consists of two syllables, namely the words *ke* and *he*, in this case the emphasis occurs at the beginning of the syllable, namely *ke* with a frequency of 213 Hz, duration of 0.334 seconds and intensity of 75.78. Then, the word *hami* which consists of two syllables, namely the words *ha* and *mi*, it can be clearly seen that the emphasis occurs at the beginning of the word, namely *ha* with a frequency of 272.2 Hz, duration of 0.4554 and intensity of 75.39. Besides that, the word *tu* does not occur emphasis and finally the word *sikola* which consists of 3 syllables, namely the words *si*, *ko* and *la*, in this case the emphasis occurs in the first syllable, namely the word *si* with a frequency of 397.3 Hz, duration of 1.874 seconds and intensity of 70.69.

Figure 3 above is an image of the analysis results using Praat. It can be seen that declarative sentences consisting of several syllables, such as the word *marsiajar* which consists of 3 syllables, namely the words *mar*, *si*, and *ajar*, then the emphasis occurs at the end of the beginning of the syllable or the first syllable, namely *mar* with a frequency of 188.2 Hz, a duration of 0.522 seconds and an intensity of 70.66. Then, the words *ia* and *di* which consist of one syllable, do not emphasis and then the last word *Medan* which consists of two syllables, namely the words *Me* and *dan*, the emphasis occurs at the beginning of the word or the first syllable, namely *Me* with a frequency of 180.6 Hz, a duration of 2.498 seconds and an intensity of 67.64 decibels.

Figure 4 above is an image of the analysis results using Praat. It can be seen that the declarative sentence consists of several syllables, such as the word *mamasu*, which consists of 3 syllables, namely the words *ma*, *ma* and *su*. For emphasis occurs at the beginning of the word or the first syllable, namely *ma* with a frequency of 200.3 Hz, a duration of 0.198 seconds and an intensity of 72.65 decibels. In addition, the word *abit* which consists of 2 syllables, namely the words *a* and *bit*, the emphasis occurs at the beginning of the first syllable word *a* with a frequency of 213.4 Hz, a duration of 0.615 seconds and an intensity of 66.77 decibels and the last word *umak* which consists of two syllables, namely the words *u* and *mak* where the emphasis occurs at the beginning of the first syllable or syllable word *u* with a frequency of 213 Hz, a duration of 0.336 seconds and an intensity of 70.58.

Figure 5 above is an image of the analysis results using Praat. It can be seen that the declarative sentence consists of several syllables, such as the word *mardahan* which consists of 3 syllables, namely the words *mar, da*, and *han*, where the emphasis occurs at the beginning of the word or the first syllable, namely *mar* with a frequency of 196.3 Hz, a duration of 0.198 seconds and an intensity of 72.65 decibels. Then, the word *kakak* which consists of 2 syllables, namely the words *ka* and *kak* where the emphasis occurs at the beginning of the word or the first syllable, namely *ka* with a frequency of 177.8 Hz, a duration of 0.292 seconds and an intensity of 79.55 and the last word kitchen which consists of two syllables, namely the words *da* and *pur* where the emphasis occurs at the beginning of the word or the first syllable, namely *da* with a frequency of 183 Hz, a duration of 0.496 seconds and an intensity of 70.18 decibels.

From the calculation of the average pitch contour, intensity, and duration of each segment, several lexeme data have been collected from the elicitation of lexeme data in the Angkola Batak language. The data is classified into two groups, namely two-syllable and three-syllable lexemes. This division is needed to be able to see the pressure of the Angkola Batak language in the initial position of the word or the first syllable in a word.

The pressure or prominence is seen from the indicators of phonetic suprasegmental aspects, in the form of pitch, duration, and intensity. The units of measurement of these indicators are Hertz (Hz) for frequency, seconds (s) for duration, and decibels (dB) for intensity. The measurement is done on each syllable in the lexemes, so the data division is done according to the number of syllables in the lexemes that have been

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elicited. Furthermore, the data can be seen in the table below:

Two-syllable lexemes

Table 1: Values of two-syllable lexemes

Informant	Syllable	Tone (Hz)	Duration(s)	Intensity (dB)
1	*ma*	175.9	0.582	73,99
	ngan	132.8	0,187	72,75
1	*ut*	323.6	0.167	65,4
	te	225	0.057	60.5
2	*ke*	213	0,334	75.78
	he	154	0,200	73, 81
2	*ha*	272,2	0,4554	75.39
	mi	207.4	0,3924	70.55
3	*Me*	180.6	2.493	67.64
	dan	161.7	0.488	61.13
4	*a*	213.4	0.615	66.77
	bit	187.6	0,219	64,53
4	*u*	213	0,336	70.58
	mak	191.4	0,256	60.36
5	*ka*	177,8	0,292	79,55
	kak	157,3	0,169	72,24
6	*da*	183	0.496	70.18
	pur	176.4	0.274	63.91

Three-syllable lexemes

Table 2: Values of three-syllable lexemes

Informant	Syllable	Tone (Hz)	Duration (s)	Intensity(dB)
2	*si*	397.3	1.874	70.69
	ko	312.4	0,2962	60.93
	la	185.7	0,3243	70.43
3	*mar*	188,2	0,522	70.66
	si	186.7	0,347	55.6
	ajar	171,8	0,6587	68.93
4	*ma*	200,3	0,198	72,65
	ma	172,7	0,152	65,11
	su	154,1	0,232	66,67
5	*mar*	196.3	0,370	76.09
	da	180.8	0,321	71.2
	han	178.1	0,401	67

By the analysis of the data obtained, it can be seen that the emphasis occurs in the initial position of the word or the first syllable in a word, this is obtained from the declarative utterances of Angkola Batak native speakers and processed using Praat software as an analysis instrument. Thus, two-syllable and three-syllable lexemes generally fall on the first syllable by the Angkola Batak speakers. This can be seen by looking at the movement of pitch, duration, and intensity in each syllable spoken. Generally, syllables that are stressed have a higher pitch and intensity value than those that are not stressed.

In terms of word stress, Tambuwun in (Schwarz, 1908, p. 41) also suggest that word stress is in the position of the second-last syllable regardless of whether the word has changed due to morphological processes. In addition, (Ticoalu, H. Th. L., Karisoh-Nayoan, W. D. Lumenan, A. B. Djumna, A. B. G. Rattu, 1984, p. 13) also suggest that Tontemboan stress is in the position of the penultima and final syllable, and is in a fixed position despite the presence of affixes. This study found that by looking at the movement of contour and pitch values, and the intensity, and duration of syllables, word stress is in the position of the penultimate syllable. Thus, the results of the data from this research support the statements and findings made by previous studies.

However, this study supports previous studies by using an experimental phonetic approach using Praat in analyzing word stress using an acoustic phonetic approach in the Angkola Batak language. In Praat, the values of pitch, duration, and intensity can also be extracted, so that it can be seen more clearly and accurately the position of word stress in the Angkola Batak language. As from the results of the data analysis obtained, it is described that the position of declarative speech stress is highlighted or emphasized at the beginning of the word or the first syllable.

4. Conclusion

Through the data above, it can be said that in the research that has been conducted using phonetic data analyzed through an acoustic phonetic approach using Praat software, the position of declarative sentence stress in the Angkola Batak language is located at the beginning of the word or first syllable. Like the word *mangan*, which consisted of two syllables, namely the words *ma* and *ngan*, the emphasis occured at the beginning of the word or the first syllable, namely *ma* with a frequency of 175.9 Hz, a duration of 0.582 seconds and an intensity of 73.99 decibels. Then the word *utte* which consisted of two syllables, namely the words *ut* and *te*, the emphasis occured at the beginning of the word or the first syllable, namely *ut* with a frequency of 323.6 Hz, a duration of 0.167 seconds and an intensity of 65.4 decibels. In addition, with the same findings in words consisting of three syllables, such as the word *mamasu*, which consisted of three syllables, namely the words *ma*, *ma* and *su*, the emphasis occured in the first syllable, namely *ma* with a frequency of 200.3 Hz, a duration of 0.198 seconds and an intensity of 72.65 decibels. The stress on the first syllable in declarative sentences was based on the high frequency value produced by Angkola Batak native speakers.

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