Prosody in Abyānei language

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Abstract

Researchers of Iranian languages, which don't use analyzing hardware, usually claim that the word stress in Iranian languages is dynamic (marked by the intensity of a sound). We can find such astatementin the article of Pierre Lecoq(1974) in relation to the Abyānei language (accent d'intensité). The main goal of our investigation was to find the correlate of word stress in Abyāneiwith the use of the sound recording equipment and statistical analysis techniques. Speech of 3 Abyānei middle aged subjects (one man and two women) was recorded in the village in spring of 2008. 40 2-syllable words were cut out of the digital recordings. Those samples (with initial and non-initial stress) were segmented (boundaries between the phonemes were marked). The vowels were analyzed by Praatsoftware (their parameters like intensity, duration, fundamental frequency etc. were extracted; see www.praat.org). The extracted sets of parameters were analyzed by ANOVA routines in Excel tables. The main result of the analysis is that the main feature of word stress in Abyānei is duration (p=0.006), in other words the stress in Abyānei is quantitative. The secondary feature is tone (F_0), i.e. the stressed syllable is sometimes marked by higher fundamental frequency. Intensity seems to play no significant role in marking the stressed syllable. Experimental study of other Iranian languages also showsthe insignificance of the intensity feature for the word stress. Persian stress is tonal, Tajik – tonal, Afghan Pashto – quantitative, Afghan Dari – quantitative, Gavruni (the language of Iranian Zoroastrians) – quantitative, Sarykoli (the language of a tribe of Pamirian origin in China) – quantitative.The place of the stress in Abyāneias compared with the Persian is shifted towards the beginning of the word. The same feature can be found in another North-Western Iranian language – Gavruni (the language of Iranian Zoroastrians).

Introduction

Historically speaking, Iranian languages from the point of view of prosody were studied insufficiently. Most of the experimental studies were dedicated to the stress in Persian. The first instrumental investigation in this field was made by P. Xānlari (1337). His conclusion was that the stress in Persian was tonal (i.e. the stressed syllable is regularly marked by higher fundamental frequency, F_0). The next experimental study was lead in Azerbaijan by A. Mamedova (1972).Her conclusion was different: the word stress in Persian is dynamic (i.e. the stressed syllable is regularly marked by higher intensity). One of the coauthors of this paper (Ivanov, 1976) checked both approaches and came to the conclusion that P. Xānlari was right: word stress in Persian is tonal.

Tajic word stress was studied by T. Xaskašev (1972) in Tajikistan. He found that the main feature of Tajik stress is tone (F_0).

In Dari of Afghanistan word stress proved to be quantitative (Ivanov 1988, Ivanov1998). That leads us to the conclusion that in closely related South-Western Iranian languages (Persian, Dari, Tajik) fundamental phonetic features may differ: two of them (Persian and Tajik) have tonal stress, one of them (Dari) has quantitative stress. A similar situation we can find in Slavic languages, wherePolish language has tonal stress (W. Jassem1959) and Russian – a quantitative one (L. Zlatoustova 1953).

The word stress in Pashto (a South-Eastern Iranian language) first was described by Sh. Asmati (1969) as a dynamic one. It was recently rechecked with modern technique (Tarbeeva 2010) and proved to be a quantitative one.

The word stress in other Iranian languages was studied very briefly. The main features of the stress in Gavruni (the language of Iranian Zoroastrians, a North-Western Iranian language) and Sarykoli (the language of a tribe of Pamirian origin in China, a South-Eastern Iranian language) is found to bequantitative (Ivanov 2009, Ivanov2008 resp.). Thus, generally

speaking,dynamic stress was discovered experimentally neither in Iranian, nor in other world languages.

Experimentation inAbyānei language

We are aware of 2 independent investigations of Abyānei language: (Lecoq1974) and (Sanāat 2008, in press). In (Lecoq 1974) there is just one phrase concerning the stress: “Accent d’intensité s’emploi, en gros, selon les règles du Persan” (p. 52).In order to refine the description of Abyāneiword stress we travelled to Abyāne in the spring of 2008. Thanks to the representative of the Cultural Heritage foundation (میراث فرهنگی Mirās-e Farhangi) we found some suitable informants of Abyānei. We could record the speech of 3 native middle aged speakers (1 man and 2 women). The interviews with them were made in 2 genres:

a) we asked many questions about their life and responded to them; sometimes the answers were very short;

b) we gave them a specially prepared set of rather primitive colored pictures, taken from (Gāzrāni 1383) and asked to comment on them.

At the same time video recordings were made. In video clips one can clearly see, to what picture each comment refers.

Selected tokens of their speech were cut out and normalized by means of Adobe Audition sound editor. The tokens were segmented and analyzed by a Dutch speech editor (Praat). You can see the pattern of the word Vyu’nā*Abyāne* (2-syllable word, see Figure 1). Vertical segmentation lines show the boundaries between phonemes. P. Lecoq gives us somewhat different transcription of this word: Viūna (3-syllable word). In our material the sound between [v] and [u] can be interpreted only as [y]. There are no indications that the sound [i] can form a separate syllable here.

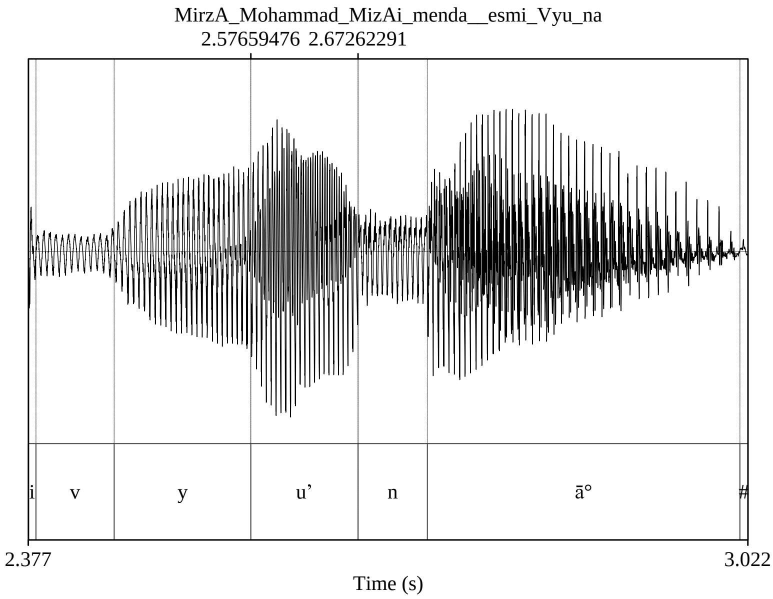

Figure 1The pattern of the word Vyu’nā*Abyāne*in the pronunciation of MM.

After the actual parameters of the vowels were measured, we calculated theirrelative equivalents in percent (%%). For instance, the word Vyu’nā*Abyāne* has the following set of relative parameters (see
Table **1**):

Table 1.Relative parameters of word Vyu’nā*Abyāne*

Length	**Fo**	**Fmax**	**Farea**	**Imean**	**Imax**	**Iarea**
291	63	91	188	94	96	289

The meanings of parameters are:

Length – duration of the second vowel in %% regarding the first vowel.

F_0 – mean fundamental frequency of the second vowel in %% regarding the first vowel.

F_{max} – maximal fundamental frequency of the second vowel in %% regarding the first vowel.

F_{area} – area under the curve of the fundamental frequency of the second vowel in %% regarding the first vowel; it is an integral parameter which combines tone and duration.

I_{mean} – mean intensity of the second vowel in %% regarding the first vowel.

I_{max} – maximal intensity of the second vowel in %% regarding the first vowel.

I_{area} – area under the curve of the intensity of the second vowel in %% regarding the first vowel; it is an integral parameter which combines intensity and duration.

Relative parameters were combined into tables for ANOVA analysis. The results of the experiment upon the duration of the stressed and unstressed vowels are shown in Table 2.

Table 2. Relative length of the 2nd syllable

Words with initial stress		**Words with final stress**	
éra$_1$	109.567	52.17014	fomi'l
o'šno	71.44938	195.0581	b?ym?'
b?y'm?	116.9043	253.7445	dora'nt
xe'le$_1$	61.875	125.1422	Olmā'n
xe'le$_2$	91.90065	143.7257	hame'
xe'le$_3$	42.98893	118.7822	dore'$_1$
va'či$_1$	110.2061	125.2222	dore'$_2$
D?'v?e	109.0219	135.2332	ketā'b$_1$
éra$_2$	41.78935	373.1518	dore'$_3$
a'mmā	130.7994	111.5423	ketā'b$_2$
va'či$_2$	32.46667	334.9693	dore'$_4$
havz-e	63.89589	544.1772	dore'$_5$
o'va	96.91196	103.4126	āli'
va'ča	141.105	298.5637	menda'
mi'za	90.42481	128.9809	ziyā'd
a'gar	97.73756	83.64444	bārke'š
e'smi	49.62362	60.7604	ni'ru
Vyu'nā°	291.7708	69.20872	obo'd
ja'vun	56.1245	129.2509	šolu'γ

Words with initial stress		Words with final stress	
xe'le4	54.4742	242.35	buda'
Mean	**93.05**	**181.4**	**p=0.00656**

It says that the stressed syllable is nearly twice as long as the unstressed syllable and this difference is very significant (p=0.00656 as compared to 0.05 level). This evidence is enough for affirming that the word stress in Abyānei is quantitative, but we will check other possibilities.

Table 3.Relative mean F_0 of the 2^{nd} syllable

Words with initial stress		Words with final stress	
éra1	66.28419	114.5154	fomi'l
o'šno	131.7826	72.41585	b?ym?'
b?y'm?	35.82921	85.75258	dora'nt
xe'le1	79.95573	89.03609	Olmā'n
xe'le2	90.68831	61.64111	hame'
xe'le3	78.18703	92.07276	dore'1
va'či1	91.34271	89.9162	dore'2
D?'v?e	87.18805	91.30421	ketā'b1
éra2	78.57715	131.8633	dore'3
a'mmā	118.0308	95.02939	ketā'b2
va'či2	93.79597	106.5986	dore'4
havz-e	98.75851	139.3487	dore'5
o'va	104.0585	105.5562	āli'
va'ča	91.03033	109.5012	menda'
mi'za	50.49992	102.6714	ziyā'd
a'gar	106.5967	120.916	bārke'š
e'smi	94.62064	90.00699	ni'ru
Vyu'nā°	63.22542	107.023	obo'd
ja'vun	97.58992	86.46663	šolu'γ
xe'le4	104.6353	95.71891	buda'
Mean	**88.1**	**99.4**	**p=0.0917**

Mean fundamental frequency is irrelevant to mark the stressed syllable (see

Table 3), because the p-parameter (p=0.0917) is much higher than the critical level (0.05).

Table 4. Relative maximal F_0 of the 2nd syllable

Words with initial stress		Words with final stress	
$éra_1$	82.37071	53.125	fomi'l
o'šno	139.2399	156.2357	b?ym?'
b?y'm?	32.72727	216.885	dora'nt
$xe'le_1$	42.72616	177.9855	Olmā'n
$xe'le_2$	88.77193	100.5151	hame'
$xe'le_3$	25.73498	99.59494	$dore'_1$
$va'či_1$	100.8104	113.1906	$dore'_2$
D?'v?e	94.33531	118.5714	$ketā'b_1$
$éra_2$	22.30971	526.0962	$dore'_3$
a'mmā	171.7216	105.8252	$ketā'b_2$
$va'či_2$	20.12082	398.1481	$dore'_4$
havz-e	36.24717	834.3602	$dore'_5$
o'va	158.2337	111.698	āli'
va'ča	136.9792	358.8383	menda'
mi'za	49.90463	143.3303	ziyā'd
a'gar	106.7811	97.73756	bārke'š
e'smi	47.03627	48.56963	ni'ru
Vyu'nā°	188.3843	69.67529	obo'd
ja'vun	43.35347	122.2416	šolu'γ
$xe'le_4$	51.83647	267.0656	buda'
Mean	**87.5**	**102.8**	**p=0.00659**

But relative maximal F_0 of the 2nd syllable (see

) seems to be a good cue for the detection of Table 4 stressed syllable (p=0.00659). So it is no wonder, that the combination of tone and duration is a very good cue for the Abyānei stress (p=0.0088; see

Table 5)

Table 5. Relative F_0 area of the 2nd syllable

Words with initial stress		Words with final stress	
éra$_1$	109.567	52.17014	fomi'l
o'šno	71.44938	195.0581	b?ym?'
b?y'm?	116.9043	253.7445	dora'nt
xe'le$_1$	61.875	125.1422	Olmā'n
xe'le$_2$	91.90065	143.7257	hame'
xe'le$_3$	42.98893	118.7822	dore'$_1$
va'či$_1$	110.2061	125.2222	dore'$_2$
D?'v?e	109.0219	135.2332	ketā'b$_1$
éra$_2$	41.78935	373.1518	dore'$_3$
a'mmā	130.7994	111.5423	ketā'b$_2$
va'či$_2$	32.46667	334.9693	dore'$_4$
havz-e	63.89589	544.1772	dore'$_5$
o'va	96.91196	103.4126	āli'
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a'gar	97.73756	83.64444	bārke'š
e'smi	49.62362	60.7604	ni'ru
Vyu'nā°	291.7708	69.20872	obo'd
ja'vun	56.1245	129.2509	šolu'γ
xe'le$_4$	54.4742	242.35	buda'
Mean	**81.98**	**205.98**	**p=0.0088**

Mean intensity is no help in detecting the stressed syllable (p=0.165, see Table 6).

Table 6. Relative mean intentensity of the 2nd syllable

Words with initial stress		Words with final stress	
éra$_1$	95.88378	99.64455	fomi'l
o'šno	104.9072	96.76585	b?ym?'
b?y'm?	88.67925	99.38875	dora'nt
xe'le$_1$	101.5854	101.4475	Olmā'n

Words with initial stress		Words with final stress	
xe'le$_2$	99.36387	90.47045	hame'
xe'le$_3$	85.85248	95.93968	dore'$_1$
va'či$_1$	98.03922	96.73279	dore'$_2$
D?'v?e	103.8945	100.2457	ketā'b$_1$
éra$_2$	92.95039	101.0165	dore'$_3$
a'mmā	102.9851	99.39541	ketā'b$_2$
va'či$_2$	92.24344	102.5445	dore'$_4$
havz-e	92.71445	102.2193	dore'$_5$
o'va	100.1202	94.62366	āli'
va'ča	95.70918	106.7974	menda'
mi'za	107.0013	105.443	ziyā'd
a'gar	101.2034	101.0626	bārke'š
e'smi	94.18052	102.1277	ni'ru
Vyu'nā°	94.89311	100.9732	obo'd
ja'vun	93.78734	95.12761	šolu'γ
xe'le$_4$	102.875	100.1239	buda'
Mean	**97.4**	**99.6**	**p=0.165**

Peak energy (maximal intensity) is very close to the critical level (p=0.0548, see

Table **7**) but still a little bit higher. It implies that we have no sufficient ground to count it as a cue for the stress.

Table 7. Relative maximal intensity of the 2nd syllable

Words with initial stress		Words with final stress	
éra$_1$	99.16067	96.47727	fomi'l
o'šno	101.3802	98.97172	b?ym?'
b?y'm?	91.80124	99.75845	dora'nt
xe'le$_1$	103.8415	100	Olmā'n
xe'le$_2$	100.1252	94.40476	hame'
xe'le$_3$	84.10673	96.91429	dore'$_1$
va'či$_1$	96.90844	97.10983	dore'$_2$
D?'v?e	104.2236	100.5931	ketā'b$_1$

Words with initial stress		Words with final stress	
éra$_2$	92.89406	101.7456	dore'$_3$
a'mmā	99.52607	99.76471	ketā'b$_2$
va'či$_2$	91.72414	104.4888	dore'$_4$
havz-e	93.06358	106.1776	dore'$_5$
o'va	101.2896	95.18214	āli'
va'ča	97.55245	110.567	menda'
mi'za	107.5064	99.88109	ziyā'd
a'gar	98.60627	103.0374	bārke'š
e'smi	90.55118	101.0976	ni'ru
Vyu'nā°	96.96616	101.5644	obo'd
ja'vun	91.93925	96.38826	šolu'γ
xe'le$_4$	101.0949	100.8485	buda'
Mean	**97.2**	**100.2**	**p=0.0548**

But if we combine intensity with duration (see Table 8) we significantly improve the cue (p=0.006).

Table 8. Relative intensity area of the 2nd syllable

Words with initial stress		Words with final stress	
éra$_1$	124.5902	56.47799	fomi'l
o'šno	71.05263	210.4116	b?ym?'
b?y'm?	99.90926	248.4241	dora'nt
xe'le$_1$	57.41196	128.0401	Olmā'n
xe'le$_2$	86.75595	124.7573	hame'
xe'le$_3$	38.99614	125.9349	dore'$_1$
va'či$_1$	74.49275	145.0909	dore'$_2$
D?'v?e	124.6172	134.5631	ketā'b$_1$
éra$_2$	23.43032	372.6962	dore'$_3$
a'mmā	142.6724	111.4796	ketā'b$_2$
va'či$_2$	28.59619	349.3174	dore'$_4$
havz-e	55.61674	664.898	dore'$_5$
o'va	83.24653	99.93412	āli'
va'ča	130.5322	316.1765	menda'
mi'za	96.92308	149.5192	ziyā'd
a'gar	101.8916	88.58896	bārke'š

Words with initial stress		**Words with final stress**	
e'smi	45.74961	59.98033	ni'ru
Vyu'nā°	289.6936	63.35714	obo'd
ja'vun	46.91877	121.4397	šolu'γ
xe'le4	51.94915	257.0766	buda'
Mean	**88.7**	**191.4**	**p=0.006**

Conclusion

The word stress in Abyānei is quantitative, i.e. the stressed syllable is usually 2 times longer than the unstressed one. Duration is the best cue for the stress in Abyānei.This outcome contradicts what has been said by P. Lecoq (1974, p. 52), who thought that intensity was playing the main role in distinguishing two type of syllables.

The second feature that can help in distinguishing the stressed and unstressed syllables is peak fundamental frequency (F_0). The peak $F_0$is in the stressed syllable usually 1.17 times higher than in the unstressed one. Mean $F_0$is indifferent to the stress. Thus tone can be considered the secondary feature of the Abyāneistress.

Neither mean intensity, nor peak energy can help us to reliablydetect the stressed syllable. So intensity is no good cue for the stress in Abyānei.

Duration is a very strong cue for the stress. Being integrated with weaker factors like F_0 and intensity into area parameters (F_{area} and I_{area}) it still plays a significant role in distinguishing both types of syllables.

Quantitative feature of stress in Abyāneiis in good concordance with the quantitative stress in another closely related North-Western Iranian language – Gavruni (the language of Iranian Zoroastrians), where we can observe a similar feature.

Being compared with the Persian, prosody in Abyāneishifts the accent towards the beginning of the word: pū́ra (ab.) ↔پسرpes?r (pers.)*boy*, j?vun (ab.)↔جوانjavā́n (pers.)*young*, v?ča (ab.)↔بچهbačč́é (pers.)*child* etc. A similar feature can be found in Gavruni.

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