ISSN 1799-2591
Theory and Practice in Language Studies, Vol. 6, No. 10, pp. 1912-1916, October 2016
DOI: http://dx.doi.org/10.17507/tpls.0610.03

The Scopes of Experimental-phonetic Analysis

Intizar Kahraman Mirzayeva
Azerbaijan University of Languages, Azerbaijan

***Abstract*—The article investigates the nature of prosodic features of speech. The discussed problem has always been interested the linguists for many years. The prosodic features such as length, accent and stress, tone, intonation and others are analysesd in the article. The article states that from the beginning of the investigation of these features were based primarily on segments – vowels and consonants and prosodic features were either ignored or forced into an inappropriate segmental mould. The author explains the meaning of the term of 'prosodic means'. She writes that 'prosodic means' is derived from the Greek 'prosodia' meaning a musical term which appears to signify something like 'song sung to music' or 'sung accompaniment'. It implies that prosody is the musical accompaniment to the words themselves. Recently, the term covers such things as rhythmical patterns, rhyming schemes and verse structure. It is necessary to stress that in linguistic contexts it encounters with a different meaning such as characteristics of utterances as stress and intonation.**

***Index Terms*—phonetics, phonology, syntagn, segment, tone, intensivity, sound, structure**

I. Introduction

It is understandable that the description of speech is classified with segmental features, such as the vowels and consonants or their attributes. Prosodic features are considered to be as segmental features of secondary modifications of segmental features. This feature has been under discussions of the major phonological schools. Bloomfield describes prosodic features as modificationss of the typical actions of the vocal organs. He (Bloomfield) includes here length, loudness and pitch. It is nevertheless to separate prosodic and non-prosodic features from one another in terms of other phonetic criteria. It is possible to separate prosodic and non-prosodic features from one another in terms of other phonetic criteria (Bloomfield 1935, p.35). Abercrombie claims that there are three components of the physiology of speaking: the subglottal component, the larynx, and the supralaryngeal component. The first one consists of the lungs, trachea, and associated muscles, produces and regulates the pulmonic air-stream which is utilized for normal speech; the second provides voice and other laryngeal features of speech; it also regulates the pitch. The third consists of the various cavities of the pharynx, mouth, and nose, and associated muscles, especially those of the tongue, acts as a kind of variable filter, modifying the air-stream so as to produce the wide range of sounds required for speech (Abercrombie 1949, p.96).

Most of the segmental features of speech are produced by the supralaryngeal component. Place and manner of articulation depend on the postures and movements of the tongue, velum, jaw, and so on. The one exception to this generalization is voice. It is generated in the larynx, along with other laryngeal features such as aspiration and glottalization. By contrast, prosodic features can be seen primarily as the result of laryngeal or subglottal activity. Tone and intonation are based on pitch, which is controlled by the laryngeal muscles, whic accentual features are often attributed to the activity of the respiratory muscles.

II. Determination of Reference

It is noteworthy to mention that prosodic features have different phonetic characteristics from segmental features. It is necessary to state that prosodic features cannot be defined solely in phonetic terms. Fry writes prosodic features can only be identified according to their linguistic role; thus, 'only those distinctions which have linguistic relevance are classed as prosodic features in a particular language' (Fry 1968, p.5). But Fox opposes 'prosodic' to phonological'. He states that the term phonological apparently refers only to segmental phonemes. However, 'linguistic relevance' is evidently broader, and it is possible-in Fry's terms-for features to be linguistically relevant without being phonological (Fox 2000, p. 7). Crystal writes claims that 'we have define prosodic systems as sets of mutually defining phonological features which have as essentially variable relationship to te words selected, as opposed to those features ... which have a direct and identifying relationship to such words' (emphasis added) (Crystal 1969, p.5). Fox states his opinion to the statement of Crystal's. He writes: "Crystal's definition is unsatisfactory, as it implies that prosodic features are not inherent in the words of a langauge. This may be true of intonation, but certainly not of accentual or tonal features. It is true that such features are frequently modified in connected speech, but then so are non-prosodic properties such as voicing and supralaryngeal features (Fox 2000, p.5).

III. Methodology

Most analysts assume that there is a maximum number of five levels that need to be distinguished. Maddieson elevates this to a universal principle: "a language may have up to five levels of tone, but not more'. Not all languages will require all of these, and indeed a system with five levels appear to be rather unusual. These five levels need to be assigned to a number of binary distinctions, and there are many different possibilities here. The choice from among these possibilities will depend on both phonetic and classificatory factors, as well as on a number of other principles, such as frequency and "markedness" of the different tones, and the kinds of tonal processes. The assumption is that features of tone are universal. This does not mean that every tone-language has the same kinds of phonetic contrasts. More or fewer of these features will be used by different languages according to the number of levels required (Maddieson 1978, p.42).

In the paradigmatic dimension, a great deal of attention has been paid to the most satisfactory set of distinctive features in terms of which tone-systems can be analysed. Investigations show that features were investigated by Prague School linguists as a means of characterizing phonemic oppositions. Jacobson developed them in a number of radical directions producing a limited set of auditory and acoustic binary features which were intended to be universal, phonetic and relational (Jacobson 1931, p.117). In the revision of Jacobson's features, Chomsky and Halle not only revert to more traditional articulatory parameters, but also allow more phonetic realism in the features. They also identify two functions for the features, 'the phonetic function' (concerned with characterizing the phonetic nature of the oppositions), and the 'classificatory function', concerned with the organization of the oppositions in phonoligical terms (Chomsky and Halle, Morris 1968, p.25).

Any advance within experimental phonetics increases confidence in the investigations carried out in phonetics. What is more, they cause an increase in the authority of phonetics as an exact science. Seeing the advantage of experimental phonetics, therefore, a number of known phonetists have began to carry out their own investigations on the basis of this method. For instance, L.V.Sherba – regarding the explanation of langauge facts and the experimental method wrote: "I have definitely know for a long time that in the Russian language it is impossible to reveal the meanings of conditional mood" (Sherba 1974, p.105). Then he added: "by using experiment – the meaning of a verb, if dealt with convincingly, may be explained. Thenceforth, he contended that in linguistics based on this method, tendencies towards subjectivism lose their importance. So, he (Sherba) said: "On the basis of my linguistic thoughts, stand language materials attained from experiments, langauge facts" (Sherba 1974, p.105).

IV. Discussion

Nowadays the necessaty of experimental phonetics increases more and more. Investigations show that in modern linguistics the majority of attained results are based upon experimental phonetics. This realization finds its justification in the increase (in number), of research works carried out by the method of experimental phonetics. New experimental laboratories are observed to be opened in diffrenet countries. By the way it is noteworthy to mention that the laboratories established by L.V.Sherba, etc. are still famous among the newly opened laboratories.

It is important to mention that the style of speech and recording of the materila is very important while carrying out the experiment.

1) The style of utterance is not only associated with profession, but equally with individual psychology and the social level of person. Depending upon intellectual ability and the the speech object, the speaker may use different forms of pronunciation. In linguistics these forms are observed to be called "pronunciation style". This term was generally used by L.V.Sherba. He wrote: "Learning different speech forms, fitting to different conditions and aims, is called speech style" (Sherba 1963, p.20).

2) Damirchizade offered two meanings (in a wide and narrow sense), discriminated these forms of style by penning. He wrote: "That is why pronunciation styles in the wide sense of meaning mean the system of puposeful colourings of phonetic means and possibilities of the language, namely they mean the system of phonetic possibilities in the oral literary language styles. Pronunciation style in the narrow meaning means pronunciation variants formulated by the manifestation of phonetic possibilities only on the frame of orphoepic norms, on the basis of purposefullness" (Damirchizadeh 1969, p.7).

It is necessary to mention that L.V.Sherba indicated two types of pronunciation styles as well. 1.Free style; 2.complete (absolute) style (Sherba 1957, p.154). Free pronunciation is encounteredin daily speech. The complete style is not observed in daily speech. It is observed in literary speech. Literary style norms are mainly used on radio and TV broadcasting, in reports, and in official talks. Damirchizadeh writes about the complete style: "The words establishing the phonetic bark of the words as to the place of articulation are very clear, but the syllables from these sounds,usually in the divided case are pronounced as the clearly distinguished rings in the speech chain.

3) Any investigation of phonetic material may be empowered by basing itself on experiment, more than the observation alone. The recording of the materila is also important in experiment. Recording highly experimental materials is made possible by using the bearers of language as announcers. Choosing the annoucers is also important. They should be either men or women. If the material for experiment is recorded by two persons, it is purposeful for them to be both men or women. It is purposeful for the announcers to be both men, or women. Otherwise, the results of the experiments may be wrong. The announcers should pay attention to their proninciation while reading the material. There shouldn't be any any artificiality. That is why it is necesary that the annoucers should read the material

beforehand. So, the text must be read distinctly and fluently. Sometimes as the announcers begin reading the material in a high tone, one finds in the second half of the process, their tones become weaker – creating obstacles for obtaining real results. That is why the material for the experiment must be recorded in parts, along with pauses. IN order to learn the phonetic changes of speeches between people of other nationalietes, the material for the experiment must be in the Azerbaijani language.

4) It is noteworthy to mention that special attetion should be paid to the choice of proper material under investigation. Materials must be selected such a way that the langauge units presented for analysis are appropriate to the speakers. It is important that each language unit is associated with real conditions. For example, in Azerbaijani any experimental investigation of word stress, needs to follow such guiding principles for conclusive results.

5) Associated with solutions regarding the division of a sentence, the materials chosen must be selected for both the syntagmatic composition of a sentence, along with the syntactic structure of a sentence. Furthermore, only appropriate sentences will do, which depending on their syntagm division, should be chosen to express different meanings. The place of syntagm-stress plays a crucial role in member-division and must be carefully taken into consideration. That is why in the choice of the sentences, one must try the same word in different meanings and different phonetic loads.

6) Any division of sentences into syntagms and their consequent function in syntagm-stress, requires that every type of sentence must find its reflection. Besides this, the inner structure of a sentence, and its lexical composition must be taken into consideration. That is why all material is taken within a context. Obviously, announcers must read the material clearly, without giving way to any artificiality – as it is in ordinary speech. Moreover, this research work demands that reading these sentences must be representative of the dialect subjected to investigation.

7) The recording device is also important in experiment. The speed of recording is sometimes associated with technical conditions, and sometimes with the objectives put forth before investigators. Aiming to check on the quality of recorded materials, investigators may carry out an analysis of hearing and listening. After an investigator specifies that the recording is at proper level, the investigator may continue the experiment. Depending on the material put forth the investigator may get the ossillogram, intonogram or spectrogram from the material Studying of segment and supersegment units of a language it is possible to use all three of them. It is considered to be necessary to take into account that the results attained by such calculation (in an ossillogram the frequency of the main tone, the line of intensivity) is given in a ready-made form by the intonogram.

At present the experiments are carried out by the program of "Praat". Praat is a Dutch word meaning "talk", "speech". It is a free scientific computer software package for the analysis of speech in phonetics. The program was designed, and developed by Paul Boersma and David Weenink of the University of Amsterdam.

The first step in experiment is calculating the frequency of the sound. The sound is considered to be important in the experiment. In the process of speech, depending on the tone-height of the pronounced sounds, the types of sentences (declarative, imperative, interrogative, exclamatory), the attitude of a speaker to the object of speech and on its emotionality change seems continual. The rise and fall of tone in the flow of speech establishes the melody of speech. At the end of a research project, the attained results (depending on calculations of the tone of voice), insist on special attention. The curves marked on the type of an ossillogram make it possible to determine the number of the circumference emerging from the movement of vocal cords, as well as the frequency of the voice. Thus, it is necessary to estimate the relativity of a complete circumference, taking place in the pronunciation of a concrete sound on the ossillogram, along with the time taken. It is shown like this F= 1_T

F- indicates the frequency of concrete circumference in the articulation of a sound;

T-indicates the time spent on the creation of one complete circumference during the articulation of the sound.

If one also takes into consideration the type of recording of the material with 1000sm speed, the given formula can be generalized in the following form:

F=1_T 1000.

The second step is the intensivity of sounds. The power of sound depends on the widening degree of the vibration, namely on its amplitude. With an increase in amplitude, the intensivity of the sound increase. In order to calculate the intensivity of the sound in the ossillagram therefore – by taking the zero line passing from the center of the ossillogram tape as a basis – it is necessary to determine the results of this widening: of the vibrations on both sides (up and down) from the zero line during pronunciation. Afterwards, putting them on a paper marked with mm, it is possible to measure the intensivity of the sound. Intensivity of sounds depends on their pronunication strength and the quality of this pronunciation. That means closes sounds, when compared with open ones, are less intensive, namely the sound /5/ which is pronounced in the same position and out of the sounds /i/, /5l/, /il/ is more intensive than the second one. In the ossillogram, the intensivity of vowels and voiced consonants have been registered (marked) (Veysalli 2016, p.100).

As with calculations of the sound tone, any calculation of the intensivity of a sound may be done in two different forms. In which case, depending on purpose, the intensivity of a sound can be calculated in general, or as parts (the beginning, the centeral part, or the end). In the process of investigating sentences, the absolute intensivity of separately taken sounds does not play a major role (Veysally 2016, p.186). So in order to calculate a relatively medium mark of intensivity, it is necessary to find the mathematical medium mark of a certain sound, and then divide it by the absolute mark of intensivity mark, the attained mark shall be relative medium mark of intensivity for that sound.

Sometimes, in the ossillograms, within the pronunciation of sounds, a separation of dimentions in the vibrations (from the zero line) are different. At this juncture, it is necessary to make a calculation on the direction in which intensivity is greater (Veysalli 2016, p.70). Any such calculation must be carried out either in the direction above the zero line, or below the zero line from the beginning till the end. It is not correct to carry out these calculations from above the zero line, or below the zero line. Additionally, the intensivity of the sounds are calculated by the intonogram. This is done with respect to the electrographic line: which indicates the intensivity given on the tape. Separating the distance from the zero line which indicates the electrographic line of the intensivity of the sound shows the difference in the intensivity of the same sound. All without having phonematic meaning in the sounds not establishing oppositions as to the features associated with positions of the sounds in the words. In Azerbaijani there are not even two phonemes, which are discriminated from each other as an aspect of their features. However, in Azerbaijani, any distinction of sounds respecting intensivity reveals itself through acoustic features as relevant signs of syntagm and sentence stress. This can be considered to be important in determining the communicative type of the sentence.

The third important step in experiment is to determine the time of the sound. Speech sounds like other sounds may be different lengths. In articulation of some sounds more time is required while in the articulation of other sounds less time is demanded. Depending on the object of the research work, sound, syllable, word, syntagm, sentence, and the bounderies of concrete speech units, are determined by an ossillogram. Indeed, the time spent on the pronunciation of any unit in the ossillogram is determined by the sign "vvvv". The distance among these signs being of the same dimentions: each dimention being equal to 10ms. For instance, let us take a sentence in Azerbaijani as an example, "Mənim xoşbəxtliyim sənsən" (You are my happiness):

Sounds	S	ə	n	s	ə	n
Time amount of the ridges	9	8	5	8,2	6,7	5,2
The speed time	90	80	50	82	67	52

The speed of pronunciation in separately take sounds has been calculated by the ossillogram.

It is necessary to mention that in written works on experimental phonetics, length is determined by the amount of language units pronounced within a one second (time) unit. The length of language units is measured by millisecond. If one marks the length of a speech unit within one millisecond by the sign T.

Listening is always very important in distinguishing tone groups. Unplanned spontaneous speech is not easy to be heard. Listening to the unplanned speech the speaker produce units which are rhythmically bound together. They are not always readily relatable to syntactic constituents, but which appear to be intended by the speaker to be taken together.

Halliday describes the intonational contour of tone groups as being constituted around the tonic syllable: 'Within the tone group there is always some part that is especially prominent... The tonic syllable carries the main burden of the pitch movement in tone group' (Halliday 1970a, p.4). The clear indication is that there is just one strong intonational movement within the tone group. It is possible to find such smoothly articulated intonational contours, but they are comparatively rare. It is usual to find tightly rhythmicaally bound structures with several peaks of prominence. Brown, Currie and Kenworthy (1980) report a series of experiments in which judges, experienced in teaching Halliday's system, were unable to make reliable identifications of tonics, hence unable to identify tone groups reliable (Brown, Currie and Kenworthy 1980, p.65).

V. Experiment

Let's analyse a sentence in English: /ma9 'brʌð7 w7z tu b9z9 tə w7 :k// According to the acoustic parameters of the sentence, the intonation contour of the sentence has been defined. The determined acoustic parameters has been written in the table, and basing on them the obtained acoustic parameters has been written in the graphic.

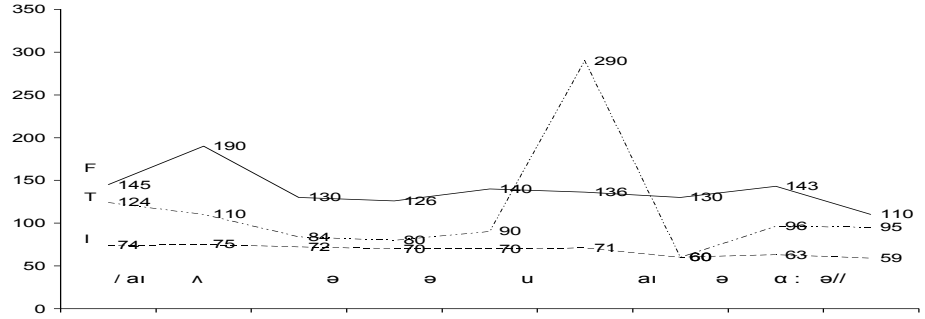
Cədvəl 1

saitlər / parametrlər	Aı	ʌ	ə	ə	u:	9	9	7	ə
f (hs)	145	190	130	126	140	136	130	143	112
i (db)	74	75	72	70	71	60	63	69	59
t (m/san)	124	110	84	80	90	290	60	96	95

The intonation contour and the frequency parameters of the main tone prove that the complete intonation has been realized. In /maı 'brʌð7 w7z tu b9z9 tə w7:k// the middle tone frequency of the vowels is observed in 139 hs, though the parameters of the main tone frequency is lower than the parameters of the middle tone frequency. For example, at the end of the sentence the vowel /7 / has the main frequency of 110hs. The interval difference is in 29hs quantity in the sentence. Though the melodic parameter of the vowel is in 145-190hs quantity, and it is higher than middle tone register. The melodic pitch in the sentence in the second sillable is 190hs and it is necessary to state that this indication is

possible for an intonation contour of a declarative sentence (See table 1, gr. 1). The analysis of the time parameter shows its differentness from the parameters of the melodicy. The middle pronunciation temp basing on the absolute parameters is 113ms. The pronunciation temp is getting to be lowered in the length parameters of the sentence. At the end syllable of the sentence the lengh of the vowel /7:/ is 95ms. The time parameters are increasing nearly at the end of the sentence, and these are the signs for an intonation of completeness. The parameters of the intensivity of the sentence show its weakining direction. The middle intensivity is 68db. The amplitude parameters at the beginning of the sentence are 74-75 db, 59ds is observed at the last syllable. The interval difference in intensivity parameters is 59 db. (See: table. 1, gr. 1).

Graphic 1



Basing on the results of the ossillographic analysis prove that in the analysed sentence the intonation of completeness has been observed.

VI. Conclusion

It is known that it is impossible to investigate the language without carrying out experiment. That is why, from a phonetic view point, speech sounds, or different language units can be examined using the scopes of the experiment. The results of a well-carried out experiment is always reliable. In Azerbaijani the experimental-phonetic analysis of language facts are supported by linguists day by day. Most universities in Azerbaijan have experimental-phonetic laboratories which help the investigators to carry out their experiments using exact calculation numbers.

(The experiment used in the article was carried out in the experimental-phonetic laboratory of the University of Languages ruled by prof.F.Y.Veysalli).

References

[1] Abercrombie, D. (1967). Elements of General Phonetics. Edinburg: Edinburg University Press.
[2] Brown, G., Currie, K.L., and Kenworthy, J. (1980). Questions of Intonation. London: Croom Helm.
[3] Bloomfield, L. (1935). Language. London: George Allen and Unwin.
[4] Chomsky, N. and Halle, Morris. (1968). The Sound Pattern of English. New York: Harper and Row.
[5] Crystal, D. (1969). Prosodic Systems and Intonation in English. Cambridge: Cambridge Universuty Press.
[6] Damirchizade, A. (1972). Modern Azerbaijani Language. Baku: Mutarjim.
[7] Fox, A. (2000). Prosodic Features and Prosodic Structure. Oxford: Oxford University Press.
[8] Fry, D. B. (1968). 'Prosodic phenomena'. B.Malmberg edited the book of *'Prosodic phenomena'*, pp.364-410. Harmondsworth: Penguin.
[9] Halliday, M.A.K. (1970a). A Course in Spoken English: Intonation. Oxford: Oxford University Press.
[10] Jakobson, R. (1931). Selected Writings I, The Hague:Mouton, pp.117-36.
[11] Maddieson, I (1978). 'Universals of tone.' J.H.Greenberg edited the book of *'Universals of tone'*, pp.335-66. Los Angeles: University of California.
[12] Sherba, L.V. (1974). The System of Writing and Speech Acts. Leningrag: Science.
[13] Veysally, F.Y. (2016). Phonetics and Phonology Problems. London: Cambridge International Press.

Intizar Kahraman Mirzayeva was born in Baku in 1988. She graduated from English Language and Literature faculty of Azerbaijan University of Languages in 2010 as bachelor degree. In 2012 she finished the master degree from Baku Eurasian University. She has been teaching English at the Azerbaijan University of Languages since that time. Now she is studying at PHD the same University. More than five articles have been published at different journals by her.