

Speech Prosody in Persian Language

Maryam Nikravesh,^{*1} Mahshid Aghajanzade²

1. Department of Speech Therapy, Faculty of Medical Sciences, Babol University of Medical Sciences, Babol, Iran
2. Department of Speech therapy, Faculty of paramedicine, Mashhad University of Medical Sciences, Mashhad, Iran

Article information	Abstract
<p>Article history: Received: 19 Nov 2011 Accepted: 1 Feb 2012 Available online: 25 May 201. ZJRMS 2014; 16 (5): 68-72.</p> <p>Keywords: Speech prosody Duration Fundamental frequency range Intonation contour</p> <p>*Corresponding author at: Department of speech therapy, faculty of medical sciences, babol university of medical sciences, babol, iran E-mail: maryam_nikravesh_62@yahoo.com</p>	<p>Background: In verbal communication in addition of semantic and grammatical aspects, includes: vocabulary, syntax and phoneme, some special voice characteristics were use that called speech prosody. Speech prosody is one of the important factors of communication which includes: intonation, duration, pitch, loudness, stress, rhythm and etc. The aim of this survey is studying some factors of prosody as duration, fundamental frequency range and intonation contour.</p> <p>Materials and Methods: This study is performed with cross-sectional and descriptive-analytic approach. The participants include 134 male and female between 18-30 years old who normally speak Persian. Two sentences include: an interrogative and one declarative sentence were studied. Voice samples were analyzed by Dr. Speech software (real analysis software) and data were analyzed by statistical test of unilateral variance analysis and in depended <i>T</i> test, and intonation contour was drawn for sentences.</p> <p>Results: Mean of duration between kinds of sentences had a significant difference. Mean of duration had significant difference between female and male. Fundamental frequency range between kinds of sentences had not significant difference. Fundamental frequency range in female is higher than male.</p> <p>Conclusion: Duration is an affective factor in Persian prosody. The higher fundamental frequency range in female is because of different anatomical and physiological mechanisms in phonation system. In addition higher fundamental frequency range in female is the result of an authority of language use in Farsi female. The end part of intonation contour in yes/no question is rising, in declarative sentence is falling.</p> <p>Copyright © 2014 Zahedan University of Medical Sciences. All rights reserved.</p>

Introduction

Often in speech and language pathology clinical investigation of voice limited to measurements of frequency elements including mean, range, histogram, mode and median. However this elements are wrathful, but we have no information about how this changes was happen in the sentences. This aspect of voice called speech prosody. Speech prosody is very complicated and has multi factors that shape this concept [1], such as pitch, loudness, duration and some factors like intonation, stress and rhythm [2]. Production and conception of speech prosody is an important factor in social interactions [3]. Speech prosody has an important role in language formation and communication between child and adult in the early stage of development [4]. Prosody assessment is important in diagnosis and intervention of speech and language disorders, diagnosis of neurological conditions and learning foreign languages [5]. Prosody influence on paralinguistic information in communication [6]. Prosody-voice characteristics that in relation with fundamental frequency, duration and voice quality can use for conception of paralinguistic information like intonation, tone and emotions in speech [7]. Intonation contour lead to distinguishing between different languages [8]. In Persian pitch changes doesn't

change the meaning of words, on the other converts a declarative sentence to an interrogative sentence, or influence on pragmatic by stress on different words in the sentence [9]. Intonation contour in Persian and English is very similar to each other. In declarative sentences and interrogative sentences with question words intonation contour is falling and in yes/no questions intonation contour is rising [10-12]. Fundamental frequency changes in intonation contour is depend on the stressed syllables [13]. Vowels duration and difference in fundamental frequency lead to variability in the intonation contour and make difference between interrogative and declarative sentences [14]. Also gender has effect on speech prosody [15]. In Iran we did not have any study about speech prosody in speech and language pathology with this method; this is the first research in this field. The aim of this survey is comparison prosody between declarative and interrogative sentences in Persian. Knowledge about this aspect of speech prosody not only use in linguistic, but also it can be a base for further clinical researches. The factors include intonation contour, fundamental frequency range and duration in sentence production. In continuous speech, pitch variations that occurs in the sentence level called intonation [16]. The amount of

fundamental frequency changes calculated from the difference between maximum and minimum of fundamental frequency that called fundamental frequency range [17]. Duration is the time that a voice consists. In some languages duration is a phenomenal element and makes semantic contrast but in Persian it is a phonetic element.

Materials and Methods

This study was performed with cross-sectional and descriptive-analytic approach. The participants include 67 men and 67 women between 18 to 30 years old, all participants have normal voice. Non-probability sampling (simple sampling) was done. Sampling includes record the voice of participants when they read sentences. Two hundred sixty eight voice sample collected from the students of Iran rehabilitation faculty. In this study at the first step, asked to participate read and signed the testimonial, then we used a questioner to describe demographic variables included age, gender, native language and catching a cold in sampling time, after that 2 speech and language pathologists listen to voice samples and corroborate their healthiness. after study of the literature in the field of Persian intonation and consult to speech and language pathologists and linguists, we collect 100 sentences with some characteristics: the sentences must be conversational and use with high frequency in daily speech, this sentences have selected from daily speech of ordinary people, we tried to avoid belong to special social group, and not depend on the education level. The sentences must be short (less than 5 words) so it is not difficult in analyzing, and also in order to keep continuity in fundamental frequency diagram and decrease disruption we tried to increase the percentage of voiced sound compared to voiceless sound in sentences. According to above criteria, we select 50 interrogatives and 50 declaratives sentences. Then content validity of 8 sentences with 13 experts was verified. Two males and 2 females read all sentences, recorded their voice, voice samples were analyzed by real analysis in Dr.Speech software (version 4, made in USA). After that we selected 2 sentences that had continuity in fundamental frequency diagram. 1- /dare barun miyad/? 2-/dare barun miyad/ (Table 1).

Sampling was done in speech language lab in rehabilitation faculty of Iran University of Medical Sciences. Factors in sampling: sampling did at least 2 hours after weak up that participant receive to his fixed voice. During sampling participants seat upright, the distance from microphone was 20 to 25 cm. Maximum Background noises was 35 db, and amplify for recording was 20 db. Voice samples record in 16 bit mono, 44,100 Hz format. Before sampling, we asked participants to read

the sentences in normal loudness and avoid emphasis on a particular word or try to convey a special meaning. At the first of recording, record one second silence, in this way we could ensure that have not noise in environment. After recording sentence duration from beginning to end of sentence calculated in level of tenths of a second. For precise determinate of sentence duration we followed this instruction: first, in real analysis software look at the wave (beginning and end of the wave is the beginning and the end of the sentence.), then with look at the spectrogram beginning and the end of the sentence was found more accurate and finally listening to the voice samples was the last step of editing. In this way duration calculated. In drawing the intonation contour; some points selected on fundamental frequency diagram (Fig. 1). Because of the duration variation between sentences, we need criteria for drawing intonation diagram. To solve this problem, in each voice sample time in each point (Fig. 1) divided to total time, so sentence duration in all samples was considered a unit (for example in a voice sample with 1.2 second duration the time of each point divided to 1.2). Then in voice samples average of frequency and time in each point (Fig. 1) calculated separately and according the means sentence intonation contour was drawn. To analyze the data about duration and fundamental frequency range we used one-way ANOVA. Data analyzed in SPSS-17 software. According to variation in fundamental frequency a general pattern for each sentence was drawing in Excel 2007 software and diagrams were analyzed.

Results

In this study duration in interrogative sentence was more than declarative sentence. One-way ANOVA test showed significant difference between sentences duration means. One-way ANOVA show significant difference in sentence duration means between gender ($p=0.008$). Data from this study showed that sentence duration in females is more than sentence duration in males (Table 2). Fundamental frequency range in females is higher than males significantly ($p=0.003$). But Fundamental frequency range between two kinds of sentences has not significant difference in genders (Table 3). In sentence intonation investigation, first sentence: /dare barun miyad/? in both groups diagram start at the 0 second (Fig. 2) and in both diagrams we see two frequency peak, that first one is shorter than second one, and at the end of sentence have rising. Finally intonation counter in first sentence is the same in males and females. Second sentence: /dare barun miyad/. Diagram start at the 0 second (Fig. 3), intonation counter has two frequency peak; at the end of sentence conversely have falling that frequency at the end of sentence is lower than frequency at the first of sentence.

Table 1. Phoneme characteristic of sentences

Sentence	n.word	N(syl)	n.phonem	n.voiced	n. voiceless	Percent of Voiced
/dare barun miyad/?	2	6	14	14	0	100
/dare barun miyad./	2	6	14	14	0	100

Table 2. Statistical data related to the duration in men and women

Sentence	N(syl)	mean		moderate		maximum		minimum	
		female	male	female	male	female	male	female	male
/dare baru miyad?/	6	1.25	1.02	1.2	1	1.6	1.3	1	0.7
/dare baru miyad./	6	1	0.86	1	0.9	1.4	1.1	0.8	0.5

Table3. Statistical data related to the changes in the amplitude of the fundamental frequency range in men and women

Sentence	N(syl)	mean		Moderate		maximum		minimum	
		female	male	female	male	female	male	female	male
/dare baru miyad?/	6	126.34	72.49	114	62.17	311	180	39	20
/dare baru miyad./	6	120.74	66.32	104.55	62.58	415	200	32	24

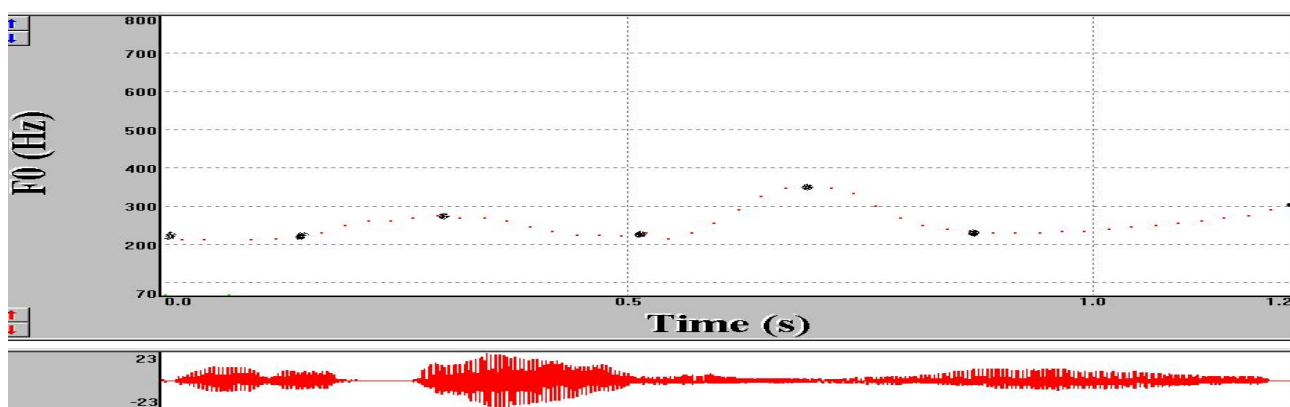


Figure 1. select points on fundamental frequency diagram in a voice sample / dare baru miyad/?

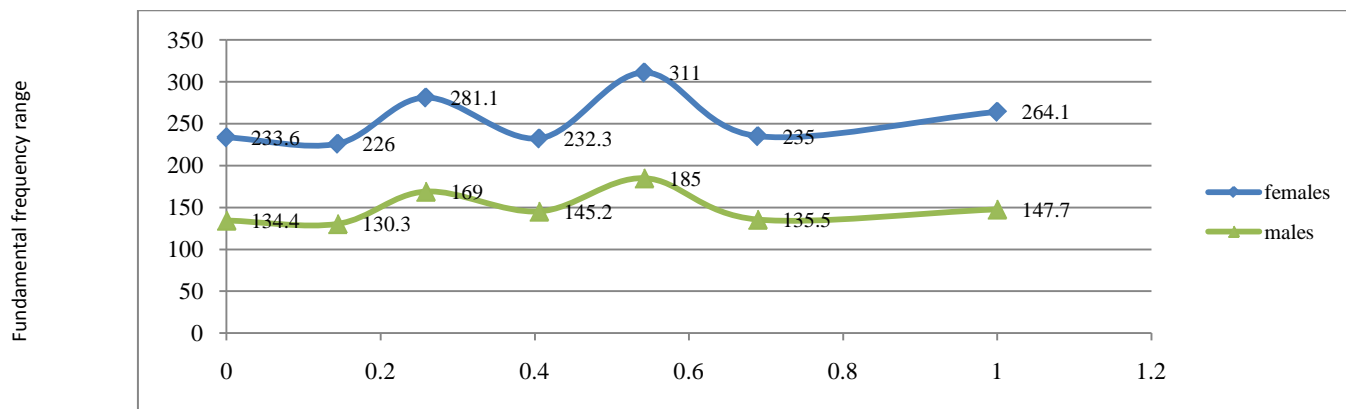


Figure 2. Intonations counter /dare baru miyad/?

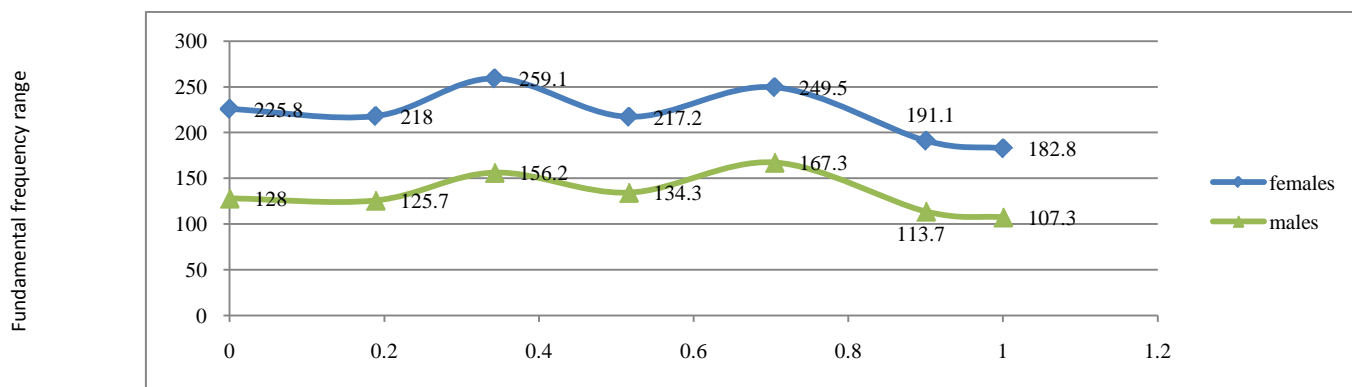


Figure 3. Intonation counter in male and female /dare baru miyad/

Discussion

Duration comparison between men and women showed that sentence duration in both sentences in females was more than males. Also fundamental frequency range in both sentences in females was more than males. Comparison sentences showed that duration in interrogative sentence was longer than declarative one, but fundamental frequency range between two sentences was the same. Intonation counter in yes/no question (/dare barun miyad/?) was rising at the end of the frequency diagram, the frequency at the end was higher than; the frequency at the beginning of the sentence, rising in frequency diagram lead to made an interrogative sentence. Frequency differences between beginning and end of the sentence in women, more than men. So that in rising at the end of the sentence in women was more than men and women use more frequency variations than men for transferring questioning mode. In interrogative sentence (yes/no question) rising was observed at the end of the sentence. This finding is similar to, Hayati [10], Mahotian [11] and Tehrani [12] findings, but in previous researches men and women have not been compared. In declarative sentence (/dare barun miad. /) the difference between frequency at the beginning and the end of sentence was more than men. In fact, women in this sentence use fundamental frequency variations at the end of the sentence more than men, but this difference was not such as interrogative sentence. At the end of declarative sentence we see falling. This finding is similar to Hayati [10], Mahotian [11] and Tehrani [12] findings. Pattern of the intonation counter in women and men were similar in 2 sentences, with this difference that women and men in their frequency range produce this pattern. Finally, we can conclude that men and women, to make changes in speech intonation use same pattern by changing duration. But women use duration for transferring interrogative more

than men. The reason of this difference between genders is women have more prolongation in vowel production so sentence duration in women is more than men. Fundamental frequency range in women is more than men in both sentences; this is because of larynx function in women also it is because of skill in voice characteristics depend on language. Frequency at the end of Yes/No question (/dare barun miyad/?) is rising. In this sentence to produce question, women make more changes in frequency at the end of the sentence than men. In this sentence we see two frequency peaks, that the first one is shorter than second one. The second peak occur when /baron/ produce, it can be concluded that both genders have more emphasis on this word. Frequency diagram at the end of the declarative sentence (/dare barun miyad. /) is falling. In this sentence we see two frequency peaks in both genders, that in women the first one is higher, but in men the second one is higher. In fact, women have more emphasis on the word at the beginning of the sentence (/dare/) and men have more emphasis on /baron/. In both genders we see falling at the end of the sentence. In both genders, frequency at the end of the sentence is lower than the beginning.

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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