

Polish: Prosodic Aspects of "Czy" Questions

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Abstract

The paper addresses the problem of the intonation of interrogative sentences with the "yes-no" question word "czy..". The final aim of the analysis is to modify a diphone synthesis program for man-machine dialogue in Polish, which is to be applied in vocal servers. Thus the task requires determining all of the prosodic cues accompanying this kind of sentences and selecting those which allow such dialogue to be successful.

Introduction

Various aspects of the phonological system of Polish have so far attracted the attention of different phonological schools. Most of them dealt with theoretical issues. In metrical phonology, stress assignment constitutes important topic and has received a great deal of attention from researchers [8, 9,14, 1,3]. These studies are mainly devoted to the assignment of word-stress in single or two-word sequences. Parallel to the interest in the theory, there is a well established tradition of acoustic analyses, with seminal influence of Wiktor Jassem. The prosodic description is, however, inadequately represented and few reliable sources on this topic are available. Although Mikołaj [13] analyses the intonation of all kinds of questions in Polish, his analysis is performed on a very limited body of questions read out in isolation, and does not take into account the problem of stress. On the other hand, Dogil is looking for correlates of secondary stress in Polish in analysing how is uttered a single sentence as answer to various questions [2]. Our work - an excerpt of it is presented here - gives an analysis on prosodic constituents of questions with the "yes-no" interrogative word "Czy".

The corpus

Out of 40 monologues adapted for Polish from the BABEL database, and read by 60 speakers [6,7], 13 interrogative sentences with "Czy...?" were extracted. The speakers included a range of female and male voices as well as vocal strategies. Out of them four typical sets of recordings were selected, reflecting casual pronunciation of modern Polish. The selection was to serve as a basis for a hypothesis on the prosodic cues involved in "Czy ...?" questions to be tested against the remaining data.

The sentences

A classification of sentences can be done according to

- their length

- their place in the paragraph
- the place of "czy" in the sentence

The range of length of sentences with "czy" is between 7 and 21 syllables. Only one sentence is beginning with "czy", the other taking place in paragraphs where only two are following other "czy" question. As for "local setting" of "czy", there are only two cases in which this word is not the first element of the sentence (07a-b). In one case, it follows "Halo?"("hello!"), in the other, the preposition "A".

The local, or intra-sentence conditions are important as well as the position of the question in the whole monologue, we sum up data about them in the following tables.

The first of them deals with the number of syllables of the question, the second with the monologue surrounding of the question.

Number of syllables	Number of sentences
7	2
8	1
13	2
14	1
16	1
17	1
18	2
19	3
20	1

Table 1: Questions classification according the number of syllables

Place of questions in monologs	
Place	Number
1 st place	1
After words "Halo, Dzień dobry"	2
After assertions	8
After questions	3

Table 2 :Questions classification according their place in the monologs

From the number of syllables of questions, it is easy to deduce that each sentence is divided in several stress groups, each of them being a part of a larger unit, and as such bearing prosodic cues different of those of the same unit in isolation.

Each sentence takes place in a larger unit, the monologue here, which set up a communicative unit. In such a larger context, questions do receive a straightforward and a feedback influence from its surrounding.

The choice of speakers

In analyses, at least one sentence of each speaker is analysed. But for two or more questions in a passage the same speakers are kept in order to see how consecutive questions are articulated versus ones in assertive context.

The accent :

Stress in Polish received a great deal of attention in nowadays phonological literature [7,8,1,13,14]. The basic assumption of these studies is that stress is a realisation of metrical structure as expressed in a labelled or bracketted grid. For Polish, on lexical level, at the right edge of a word, there is a binary foot composed of a strong syllable followed by a weak one[8,13]. This final foot receive the main accent. This general rule encounters few exceptions. Extremicallity rule [4], or the Edge Marking Parameter [5, 1] takes these facts into account.

sw	sw	sw	sw	sw	sw
'wtorek	'rano	'Pani	'móg[ɫ]by	'równie	'jakãÊ

Table 3: Stress in bisyllabic words in Polish

Trisyllabic words follow the same rule, with a weak syllable before the final foot.

ws	ws	ws
cu'kierna	go'towy	za'mówief

Table 4: Stress in trisyllabic words in Polish

For longer words, before this last foot one or more weak syllables can be observed. Initial syllable may have a secondary stress [14].

wsw	sww	wsw	sww
oko'licy	_oko'licy	restau'racje	_restau'racje

Table 5: Stress in quadrisyllabic words in Polish

In sentences, the metrical constituency above the word level will apply, and morpho-phonological input as well as the semantico-syntactic one[11,12]. At this level, the main problem is to prevent an accent clash, or two consecutive stressed syllables. As it is noticed, as Polish is a inflexional language, word order is free, so speakers can avoid clashes by word order, and thus satisfy eurhythmicity[4].

The analysis

Out of 13 questions, 5 show alternating strong and weak syllables (questions 01, 06, 07, 08, 09, R4). In all of these examples strong syllables are separated by one or two weak ones.

As this paper, is devoted to show the various analysis performed in order to synthetize Polish with a good quality, we selected one question, the shortest for practical purpose. This sentence is extracted from the R2a passage. It stands at the beginning of the passage, just after “Hallo”, and before an assertion and another question.

There are many contributions to the stress system of Polish. For the sentence studied here, all agree in giving the following scheme:

Czy to Domy Centrum
w w sw sw

Durations

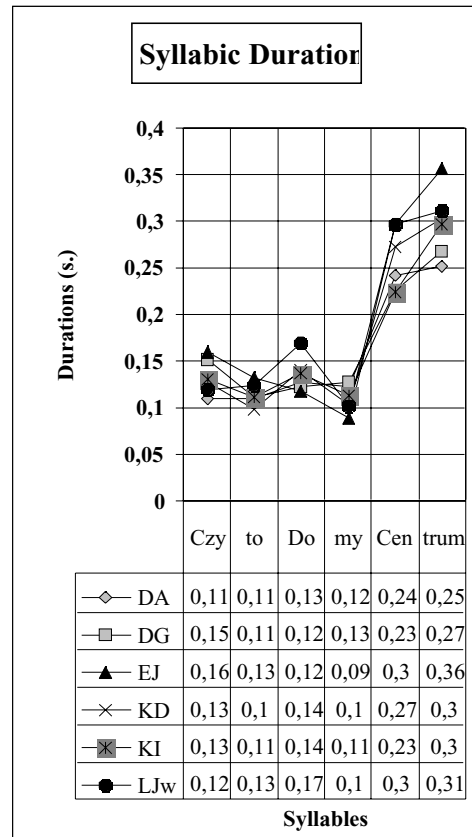


Table 6 : Syllabic durations in the R2a question “Czy to Domy Centrum” [tʃɨ to 'dɔmi tʃɛntrum] for 6 speakers, Speakers are DA(F;19), DG (M;23), EJ(M;59), KD(F;24), KI(M;24) and LJw(F;29). All speakers but LJw (Wrocław) are recorded in Warsaw

After segmentation of sentences, labelled syllables are measured. Previous table gives an exemple of such a work on the shortest sentence.

Intensity:

As quoted by Dogil[2], Polish is a system with a weak stress. The first descriptions of Polish stress point out a slight increase of intensity to be its main correlate. But acoustic measurements done by Jassem[9], that out of stress acoustic correlates, duration, Fo, intensity and spectral structure only Fo is linked with stress.

More recently, Dogil[2] verified Jassem’s results and founded that the only actor correlating with primary stress was the occurrence of the highest Fo with a sharp Fo slope. For secondary stress, duration and “the fully articulated vowel” show the higher prominence of the syllable.

So, in both cases of accentuation, intensity do not seem to play an important role. On the following example it is possible to see that the dynamic of the whole question is standing in a range of few Db.

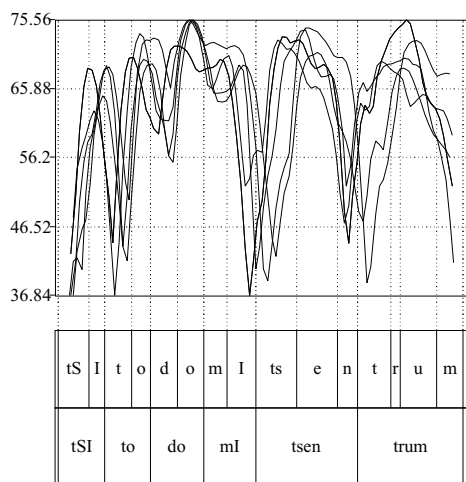


Table 8 : Intensity analysis of R2a question. Spoken by the same speakers. Phonetic and syllabic segmentation is done on Speaker DA utterance.. Phonetic and syllabic transcription is done using SAMPA

Intonation

First analysis of Fo were done by measuring fundamental frequency in Hz. In order to allow easier intra-speakers comparisons, the semi-tone scale is used. So advantage is given to a scale that gives emphasis to perception and allows easier inter-speaker comparisons.

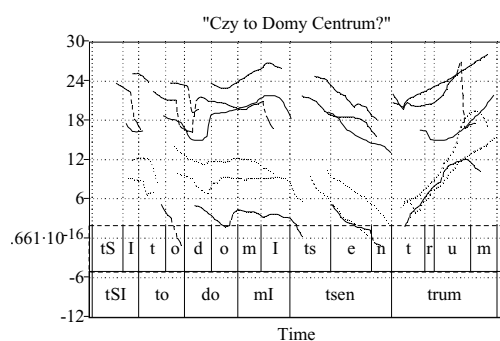


Table 7 : Semitone analysis of R2a question. Temporal segmentation (SAMPA) is done on DA utterance. Phonetic and syllabic transcription is given using SAMPA

First results

Stress and its perception

The place of accents in question was investigated by skilled linguist. He was asked to determine on the basis of the records, the perceptive place of stress. So, it was to compare its theoretical place with its actual one. The results show, on the given example, a similar accentuation scheme for all subjects. This scheme agree with the one derived from theoretical level. For longer sentences, place of main prominences will be established mainly from informative and communicative level (11-12), and intra-speakers variation in stress place was found.

R2a	Czy	to	Do	my	Cen	trum
DA			x		x	
DG			x		x	
EJ			x		x	
KD			x		x	
KI			x		x	
LJw			x		x	

Table 8 : Subjective place of stress for R2a question given by skilled linguist. For this sentence, the perceived place of stress is the same for every speakers.

Intensity :

As reported below, intensity is not an important prosodic cue. There is no significative change of intensity between the strong and the weak member of the basic bisyllabic foot.

F0 curves :

The main characteristic of "Czy" questions in Polish is a double climbing binary foot at the beginning and at the end of the sentence. According to main focus in the sentence, curve may be labeled as Bottom-Top or Low-High. This structure is well preserved in longer sentences, even if a resetting pause is produced for long groups. The presence and the location of this kind of pause is obvious from analysis in semitone of F0 curves.

Durations

R2a	w	w	s	w	s	w
Polish	Czy	to	Do	my	Cen	trum
SAMPA	tSI	tO	dO	ml	tsEn	trum
IPA	tʃi	tɔ	'dɔ	mi	'tsɛn	_____
DA						
F0	M	M	L	T	B	H
DG						
F0	M	M	L	M	B	T
EJ						
F0	M	H	M	L	B	T
KD						trɔɔn
F0	H	M	S	S	B	T
KI						
F0	M	M	S	L	B	T
LJw						
F0	H	M	M	H	B	T

Table 9 : Symbolic coding of intonation for the R2a speakers. The “Czy” question is given first in Polish, then using SAMPA and IPA transcription in the following lines. Deviation in sentence speaking, if any, is indicated in the speaker row. The final binary foot is coded as “Bottom-Top” or as “Bottom-High”. In this case, a contrast “Low-Top” appears in the preceding binary foot.

The main observed cue for “Czy” questions is the final climbing F0 on unstressed syllable following a stressed low syllable. As a consequence of this F0 movement, the final syllable duration is longer than the stressed preceding one, on which a sizeable lowering of F0 is noted. This final binary foot maybe echoed on F0 level in “Czy” sentence in the first part of the question.

Discussion

The main points we are giving a survey of in this paper are, if we take into account the final aim of this study are:

Stress assignment :

Acoustical correlates of stress in “Czy...?” questions.

Here we do not intend out of the data presented here to choose between the “classical” point of view [8, 4], and the one[5] applied to Polish by Dogil[1,2]

As specified, the possible correlates of stress are duration, Fo, and intensity.

For duration, the utterance, is organised , for all speakers, upon a trochaic basis, following the model

/Long-short/long-short/ long-longer/

The final foot, bearing the main accent, is build up by the penultimate stressed syllable and the unstressed final. As this last one bears an important Fo shift, its length is increased by physiological constraints

The former ones show the casual “unmarked duration pattern” with a long syllable preceding a shorter one.

The Fo curve is organized in function of the final question intonation contrast. . This contrast, is noted usually “Bottom-Top”, and for one speaker (DA) as “Bottom-High”. For DA, the maximum of the Fo curve is found on the former foot “Domy”. The melody of the preceding syllables shows less agreement among speakers.

For intensity, no correlation was found between stress and intensity. Strong and weak syllables, in the same foot, have more or less the same intensity.

Conclusions

For this paper, we used a little excerpt of data collected and yet analysed out of the Polish adaptation of BABEL corpus. For practical purpose, examples of longer questions with resetting of F0 are not given in this paper.

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