

VOWEL QUANTITY IN CZECH

An instrumental study

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1. Introduction.

The purpose of this investigation is to examine the relationship between long and short stressed vowels in Czech.

Data on the duration of Czech vowels have been published by others, particularly Josef Chlumsky (1) and L. Kaiser (2) (based on research by P. Janota). A brief comparison between the conclusions reached by these authors and those of the present paper will be given at the end of the paper.

In order to get as uniform a material for the present investigation as possible some preliminary investigations were made with the purpose of determining whether the duration of vowels is influenced by the number of syllables and/or the length of a following syllable.

Word lists of the type host, hosti, hostitel, hostitelka, hostitelkami were set up and the duration of the first vowel were measured and compared. These series of words are referred to as α -words. In a number of word pairs of the type zubu, zubů ['zubu] ['zubu:] the duration of the first vowel was measured. These examples are referred to as α -words. Lists of α -words and β -words together with the results of this analysis are shown in Tables 1 and 2.

As it is seen, it is necessary to consider the number of syllables and, to a certain degree, also the length of the following syllable when vowel duration is to be investigated. In the last and main part of this study only dissyllables with short second syllable are analysed. As the purpose of the investigation is to examine the relationship between long and short vowels, only words with long and short a, e, i, o, u in the stressed syllable are considered, since the opposition long: short is neutralized in vocalic r and l.

Since the following consonant may influence vowel duration all vowels are examined in positions before (1) nasal/liquid, (2)(3) voiced and unvoiced fricatives, and (4)(5) plosives.

The structure of the investigated syllables in this part of the study is: (c)cv(:) (This is not necessarily the case with the α - and β -words.)

As the physical duration usually depends on vowel quality, the material is so arranged that long a is compared with short a, long e with short e, etc.

The utterances were recorded in a sound treated room on a professional tape recorder at the Institute of Phonetics. The words were read in a quasi-random order, the only restriction being that words of the type host, hosti, hostitel ...etc., zubu, zubú or zakop, zákop did not occur adjacent to each other. Each word was read as an isolated utterance with a pause between each utterance, and the informants were asked not to make any rhythmic groups in their reading.

Five informants were used:

JL (male) born in Prague in 1943

OL (female) born in Prague in 1943

LM (female) born in Prague in 1944

BU (female) born in Prague in 1944

AKK (female) born in Danmark in 1944; bilingual (mother Czech, father Danish).

The complete material consists of 1170 utterances (117 examples each recorded twice by all 5 informants).

2. Recording of acoustic curves.

The utterances were subjected to acoustic analysis by means of an intensity meter (KTH type) and Frøkjær-Jensen's pitch meter and recorded on the mingograph. Four synchronous traces were recorded on the ink writer: (1) a pitch curve, (2) a logarithmic intensity curve with an integration time of 2,5 ms for female voices and 5 ms for male voices (the high-pass filtering in connection with the logarithmic scale conditions that the consonants stand out rather distinctly, (3) an intensity curve (linear scale) with an integration time of 5 and 10 ms, respectively, and with linear frequency response, and (4) a duplex oscillogram (i.e. a combination of an ordinary oscillogram and a high-pass filtered intensity curve).

The logarithmic intensity curve and the duplex oscillogram were used to delimitate the sounds before measurements were made. The speed of the paper was 100 mm/sec.

Table 1.a.

Informant	JL					OL				
	1	2	3	4	5	1	2	3	4	5
pan dám	20 30,5	12,5 24	12 20,5			19 30,5	10,5 25	9 19		
demokrat let krém lék	17 26,5 25,5	12 21 22	10 10 18 15	9 15,5	8,5	15,5 27 25,5	10,3 22 20,5	9 9,5 16,8 15,6	9,3 16	7
bych list mír lít mýt	16 14 25,5 19 22,5	9,3 9,5 24,5 14,5 16	7,8 7 12,5 14,5	7 10,5		15 15 28 21 24	10 10 25 14,5 15,3	9 9,5 14,5 14,5	7,5 11,8	
host dóm	17,8 34	12,3 25,5	11	9,5	7	17 31,8	10,3 24,3	10	8,5	6,3
tuš muk -	13 12	8,5 9	8,5			16,5 14	9,5 10	9		

Table 1.b.

Informant	LM					BU				
	1	2	3	4	5	1	2	3	4	5
pan dám	20,3 47,5	14 36	13,5 32			17 30	10 25	7 21		
demokrat let krém lék	15 38 35	9,8 34,5 24,3	11,3 8,5 25,5 23,8	10 27,8	9,3	10,5 24,5 23	6,5 24 15	7,5 6 19,2 16	7 19	5,5
bych list mír lít mýt	15 13 43,5 30,8 36,5	9,6 9 36,3 26,8 27,5	8,5 8,5 25,3 23,5	7,8 17,5		13,2 11,5 26 16 17	8,3 8 22,5 13,8 14,5	7,5 7,5 12 13,5	7 11	
host dóm	13 45,5	8,5 36,4	8,5	7,8	8,5	12,5 22	11 19	8	10	9,5
tuš muk -	13 12	10 9,8	7,3			10 12,5	8,5 10	8		

Table 1.c.

Informant	AKK				
Number of syllables	1	2	3	4	5
pan dám	14,3 27	12,8 21	10 18,3		
demokrat let krém lék	12 23 24,5	10,5 19,8 15,5	7,3 8,5 16,5 12,9	7 15,3	6,6
bych list mír lít mýt	11 10 26,3 19,8 17,8	8,8 8,1 19 13,5 12,8	7,5 11,5 11	7 10	
host dóm	13,5 28	12 20,3	9,5	12	9,3
tuš muk -	12,3 8	9,8 7,3	7,5		

α -words. Vowel duration of first syllables in cs. All five informants. (Averages of two recordings.)

pan - panel- Panama

dám - dáma - dámami

demokrat - demokrata - demokratičnost

let - letec - letectvo

krém - kréma - krémový- krémovými

lék - lékař - lékaře

bych - bychom

list - listu - listina - listinami

mír - míra

lít - lítost - lítosti - lítostivý

mýt - mýtit - mýtina

host - hosti - hostitel - hostitelka - hostitelkami

dóm - dóma

muk - muka - mukami

tuš - tušit

Table 2.

	JL	OL	LM	BU	AKK
draho	14,3	13	17	13,5	12,5
drahý } drahá }	12,3	10,9	12	8	11,7
našich } našim }	9,5	11,5	10,4	10,3	11,6
naším	9	10,8	11	9,5	11,5
cesta	9,5	9,1	10	7,8	11,5
cestář	7,5	8	9,2	8	8,3
cena	11	10	14,3	8,8	9,5
ceník	9,5	9	13	7	9,5
ryba	9,3	10,3	12,8	13	10,3
rybám	9	9,5	10,8	10,5	10,5
syto } syta }	8,9	8,2	8,3	6,8	7,6
sytá	7,8	8	7,3	6,5	7,5
doma } domu }	13	12,5	16,3	12,5	11,8
domů	12	10	16	12	12
dostat	11,5	11,5	9,5	10	10,8
dostát	10	9	11	9	11,8
dobro	11	9	12	11	10,3
dobré	9,5	9,8	12,3	9,3	9,8
zubu	9,5	10	12	9	9,3
zubů	9,5	9,5	11	8,3	10,8
dáma	24	25	36	25	21
dámách	24,5	21	33	21	21,5
léto	17,5	20,5	28	17,5	17,3
létům	16,5	19,8	28,8	15,5	17,3
lípa	16	16,5	33	14	16,3
lípách	15	16	29	11	16
-					
půda	20,5	18,8	37,5	20	21,6
půdách	20	15,8	34	21	16

β -words. Vowel duration of first syllables in cs. All five informants. (Averages of two recordings.)

Table 3.

nasal/liquid		fricatives		plosives	
		unvoiced	voiced	unvoiced	voiced
short	nanos panel	nasyp našim našich	draho	zakop	zabal
long	nános dáma	násyp	dráhy	zákop	zábal
short	cena	nechat	sever	peče letec	cedit
long	kréma	-	réva	péče lékař léto	-
short	vina	bychom	lyže	syto syta	lidi ryba
long	vína míra	východ	líže	síto lítost mýtít lípa	líbit
short	doma domu	vosa	lože	copak	voda
long	dóma dómu	-	-	kóta	móda
short	suma	duše tušit	muže	kupec muka	tuba zubu
long	vůle	způsob	může	důkaz	půda

Words used for the main part of the present investigation (as it is seen, some α - and β -words are included).

Table 4. Vowel duration in cs.

	a	e	i	o	u
JL	11,4	10,3	9,3	11,2	9,9
OL	10,7	10,1	9,9	10,9	9,2
LM	12,1	12,1	11,4	12,5	12,4
BU	10,3	9,0	9,0	10,7	9,4
AKK	<u>11,6</u>	<u>10,2</u>	<u>9,6</u>	<u>11,4</u>	<u>9,9</u>

average:

11,2 10,3 9,8 11,3 10,2

	á	é	í	ó	ú
JL	22,4	21,6	18,0	22,2	18,9
OL	22,6	22,5	16,4	23,1	17,5
LM	31,8	33,7	30,2	32,1	34,6
BU	22,0	22,2	19,2	20,6	18,2
AKK	<u>18,7</u>	<u>20,2</u>	<u>17,3</u>	<u>18,3</u>	<u>16,2</u>

average:

23,5 24,0 20,2 23,3 21,1

As might be expected the close vowels are shorter than the more open ones.

The influence of the following consonant on vowel duration is seen in the following table.

Table 5.

	nasal/liquid	fricatives		plosives	
		unvoiced	voiced	unvoiced	voiced
short vowel	11,2	9,7	12,3	9,0	10,4
long vowel	25,0	18,8	25,5	20,2	22,0

The following consonant clearly exerts an influence on vowel duration. Vowels followed by unvoiced consonants are shorter than vowels followed by voiced consonants (and liquids/nasals).

The material is clearly divided into long and short vowels. There is no overlapping at all.

3. Conclusion.

As to the main question raised in this paper it seems difficult to stipulate a permanent ratio between long and short vowels. The informants' long vowels are two to three times as long as their short vowels, although the average seems to be about twice as long. Further investigations are necessary in order to decide whether this is valid for unstressed vowels as well.

According to Chlumsky's investigation from 1928 i and u are shorter than other vowels, especially shorter than a. Long vowels were found to be twice as long as the corresponding short ones, and the number of syllables was found to influence vowel duration in the same way as found in the present investigation. The following consonant does not, according to Chlumsky, influence the duration of the preceding vowel. This statement disagrees with the result reached in this investigation. Chlumsky has no conclusion about influence of long and short vowels on the duration of the preceding vowel (the β -words of this paper).

L. Kaiser quotes some measurements of the duration of Czech vowels spoken in isolation by 5 subjects. These measurements also show long vowels to be twice as long as short vowels in ordinary speech tempo, and open vowels to be longer than close vowels.

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References:

- (1) Josef Chlumsky, Česka kvantita, melodie a prizvuk (1928).
- (2) L. Kaiser, "Phonetic Similarity Apart From Linguistic Affinity", Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung 17 (1964), pp. 243-249.