

VOCALIZATION SIGNS AND OBSERVED
DURATION OF VOWELS IN MODERN HEBREW

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Introduction

Concerning the relationship between vowel signs and length of vowels in Hebrew, it has been said that; "The vowel signs were designed to indicate the quality (sound) of the vowels, not their quantity (length of time taken to utter the sound). Most of the signs are, in fact, ambiguous as to quantity, representing sounds that are now long, now short. For the present it may be noted that $\bar{\text{a}}$, $\bar{\text{i}}$, and $\bar{\text{u}}$ represent vowels that are often a lengthened modification of short a, i, u (represented by a , i , u), respectively. Distinctions of length are not observed in the pronunciation of modern Hebrew, but they are significant for understanding various grammatical phenomena."1) and also; "Changeable vowels depend for their length and quality on the stress. Their primary form is short a , i , u . In the stress or near it, these generally lengthen and undergo a qualitative change, becoming, respectively, $\bar{\text{a}}$, $\bar{\text{i}}$, $\bar{\text{u}}$ "2).

On the other hand it is said that "Vowels in accented syllables are longer than in unaccented ones" in modern Hebrew3).

Laufer Asher has studied the phenomenon of vowels in speech sound of modern Hebrew in Israel4).

It is the purpose of this study to compare the actual duration of vowels in some words in modern Hebrew with so called vocalization (vowel) signs which have been still functioning traditionally up to the present.

1. Design

Hebrew is one of the Semitic languages and the relationship between consonants of root and vowels serves to qualify the meaning. There are two kinds of formatives in Hebrew. One of them called "misqal" in Hebrew ("pattern" in English) is combined with the root and the other one which means "suffix" and "prefix" is added to "basic element"5).

There are four types of vowels in quality and every vocalization sign is categorized into one of them, for instance:

- long vowel ; qamaṣ($\bar{\text{a}}$)/a/, šere($\bar{\text{e}}$), suruq($\bar{\text{u}}$)
ḥolam($\bar{\text{e}}$), ḥolam gadol($\bar{\text{e}}$)
ḥiriq gadol($\bar{\text{i}}$) etc.
- short vowel; pataḥ(a), segol(e), ḥiriq(i)
qamaṣ qatan(a)/o/, qubbuṣ(u)

"sheva" ; sheva na' (ְ) (mobile sheva)
 sheva naḥ (ֿ) (quiescent sheva)

"ḥataf" ; ḥataf pataḥ (ְ), ḥataf segol (ֿ),
 ḥataf qamaṣ (ֿ)

Modern Hebrew in Israel has five vowels and 22 consonants. The five vowels are as follows: /i/, /e/, /a/, /o/, /u/. So called "segolate" nouns are the one having the patterns of /Cl₁eC₂eC₃/ in single form and /Cl₁*C₂aC₃i:m/ in plural form, where "*" is the sign for sheva na'.

On the other hand, Verbs consisting of three consonants of "root" and the "pattern" of /Cl₁aC₂aC₃/ in the past tense, the third person, male and single is called "QAL" verb. The following 18 of segolate nouns and 13 of "QAL" verbs are selected for this experiment.

Table 1: Hebrew words in "segolate" nouns.

No.	Root	Word(single)	Word(plural)
1	b g d	BEGED /beqed/	B*GAADIIM /b*gadi:m/
2	b d q	BEDEQ /bedek/	B*DAAQIIM /b*daki:m/
3	d v q	DEVEQ /devek/	D*VAAQIIM /d*vaki:m/
4	p t q	PETEQ /petek/	P*TAAQIIM /p*taki:m/
5	m t q	METEQ /metek/	M*TAAQIIM /m*taki:m/
6	d g m	DEGEM /degem/	D*GAAMIIM /d*gami:m/
7	d v r	DEVER /dever/	D*VAARIIM /d*vari:m/
8	q v r	QEVER /kever/	K*VAARIIM /k*vari:m/
9	g v r	GEVER /gever/	G*VAARIIM /g*vari:m/

Here the capital letters are utilized to transcribe the vowel signs in Hebrew for convenience. The vocalization signs transcribed are as follows:

segol; E, sheva na' ; *, qamaṣ; AA, ḥiriq gadol; II,

Table 2: Hebrew words with root of "k t v" in "QAL" verbs.

1 KOOTEEV	2 KOOTEVET	3 KOOT*VIIM	4 KOOT*VOOOT
5 KAATAVTTII	6 KAATAVTTAAH	7 KAATAVTT	8 KAATAV
9 KAAT*VAAH	10 KAATAVNUU	11 K*TAVTTEM	12 K*TAVTTEN
13 KAAT*VUU			

Here the capital letters are utilized to transcribe the vowel signs in Hebrew for convenience. The vocalization signs transcribed are as follows:

ḥolam; OO, ḥolam gadol; OOO, segol; E, ṣere; EE, ḥiriq gadol; II

sheva na^ʔ; *, qamaṣ; AA, pataḥ; A, suruq; UU

2. Procedure and method

The informant of this experiment was a female, native speaker of Israeli Hebrew. The words above were presented to the informant to read as insertion form of sentence, the precursor of which is /hamila:hazo:t/ meaning "This word is". The recording was performed in the anechoic recording studio in the Research Institute of Logopedics and Phoniatrics, while the informant was asked to read the words at normal tempo of her speech three times over. The recording tape used here was SONY ULH 7-550-BL. The speech sound was analyzed with LPC analysis program⁶⁾ and SPSS program on the VAX-11/780 System. The difference of the duration of vowels was examined by means of T-test.

3. Results and discussion

Fig.1 and Fig.2 give the fundamental frequency contour and amplitude for some words in "segolate" nouns and "QAL" verbs mentioned in the present study. It is remarkable that there was no big difference of amplitude between vowel /e/ (E1) in the penultimate syllable and vowel /e/ (E2) in the ultimate syllable both in DEBEQ and BEGED. Fig.3.1 and Fig.3.2 show the mean duration of vowels of words in single and plural form. The difference of the duration of vowels examined with T-test is shown in Table 3.

Table 3. Difference of duration of vowels in modern Hebrew

	<u>Sheva na^ʔ</u>	<u>E1</u>	<u>E2</u>	<u>AA</u>	<u>A</u>	<u>II</u>	<u>OO</u>
Sheva na ^ʔ	/						
E1 (segol)	*	/					
E2 (segol)	*	****	/				
AA (qamaṣ)	***	*	*	/			
A (pataḥ)	*	***	***	*	/		
II (ḥiriq gadol)	*	*	*	*	***	/	
OO (ḥolam)	****	*	*	**	*	*	/

The significance level is as follows:

* $p < 0.001$, ** $p < 0.005$, *** $p < 0.05$, **** $p < 0.5$

It is both difficult to distinguish the vowel /e/ in the first syllable from the one in the second syllable in "segolate" nouns and "sheva na^ʔ" from "ḥolam" with regard to duration. Concerning the other vowels, they are quite different in duration.

The result shown in table 4 is very interesting and remarkable. The duration of "sheva na^ʔ" is a little longer than that of "qamaṣ" or "ḥolam" in both single and plural form despite being insufficiently significant. It is, however, shorter than

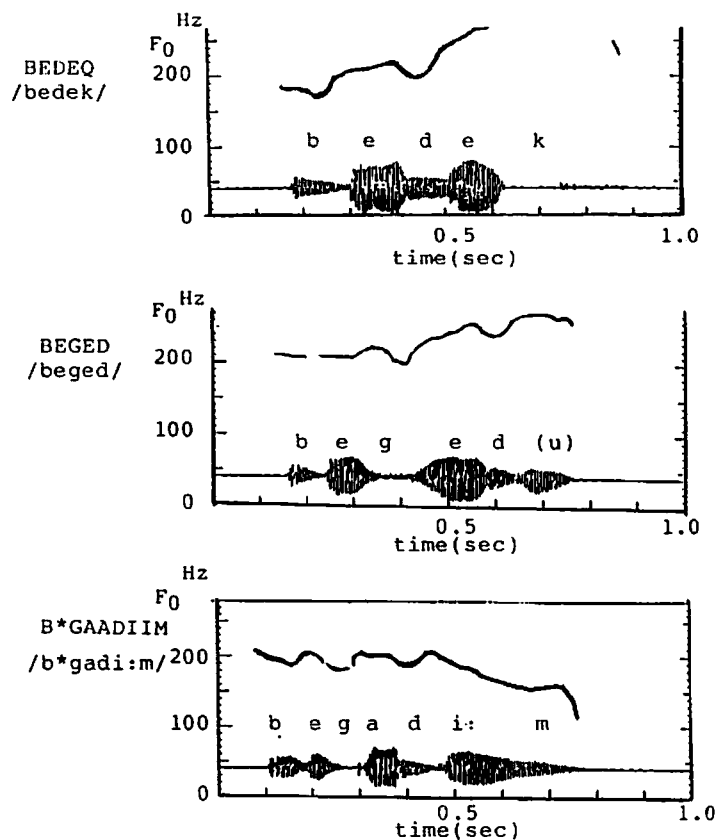


Fig.1 The fundamental frequency contour and amplitude for the words as follows;BEDEQ, BEGED, B*GAADIIM.

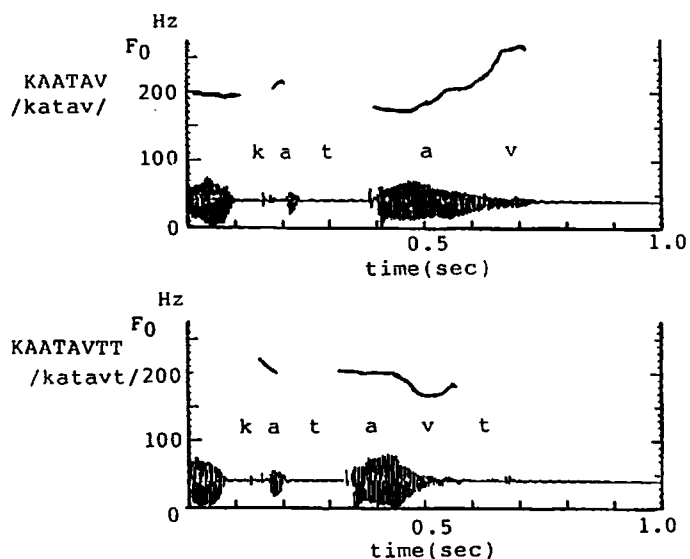


Fig.2 The fundamental frequency contour and amplitude for the words, KAATAV and KAATAVTT.

the duration of "segol". This is a considerable finding compared with the descriptions with regard to the vowels in Hebrew grammar, where "sheva na'" is generally explained as a vowel of shorter duration than the other vowels. As far as the result of this study, it is not shorter, but longer than "qamaš" and "ḥolam". Another remarkable result is found in the difference of duration between "qamaš" and "pataḥ". The duration of "pataḥ" is much longer than that of "qamaš" and the difference between them is significant though the vowel signified by "qamaš" or "pataḥ" has been considered as one of the long vowels or one of the short vowels respectively.

Table 4. Duration of vowels in modern Hebrew (msec)
"segolate" nouns and "QAL" verbs in modern Hebrew.

	<u>Single</u>		<u>Prural</u>		
<u>syllable</u> <u>vowels</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>3</u>
Sheva na'			47.6		
E1(segol)	105.8				
E2(segol)		110.6			
AA(qamaš)	42.6		32.0	78.3	
A (pataḥ)		150.2		121.8	
II(ḥiriq gadol)					171.4
OO(ḥolam)	42.3		40.5		

As to the duration of vowel "qamaš", it is much shorter in the first syllable, while it becomes longer in the second syllable, though still being shorter than that of "pataḥ" in the second syllable. This phenomenon could be explained as the anticipatory effect due to the stress structure of Hebrew language. In Hebrew stress usually falls on the ultimate or penultimate syllable. The vowel "ḥolam", for instance, is much shorter in the first syllable though it is so-called "long vowel" in phonology. On the contrary, "pataḥ" is much longer in the final syllable, though it is a so-called "short vowel" in phonology. The duration of "ḥiriq gadol" is the longest of all in this experiment. It is in agreement with the fact that "ḥiriq gadol" belongs to the final syllable accented in the case of plural of "segolate" nouns, the "pattern" of which is /C*Ca:Ci:m/. The actual duration of "ḥiriq gadol" was longer than that of "qamaš" as the result of this experiment. Observing the results in Table 5 well, it becomes quite clear that the duration of vowels depends on the syllable which the stress falls on, but not on "long" or "short" vowels, the name of which was given by grammarians in the early period of Hebrew study.

As far as the single form of "segolate" nouns is concerned, the difference of duration between the two vowels of E1 and E2 is not sufficiently significant. It is difficult to define that the penultimate syllable is stressed concerning the fundamental frequency, amplitude and duration of vowel E1 though it has been believed that the stress falls on the penultimate syllable in

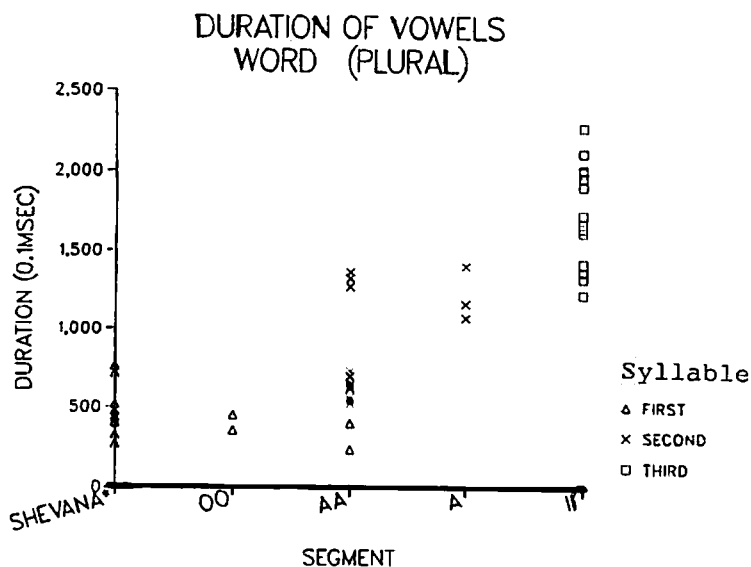
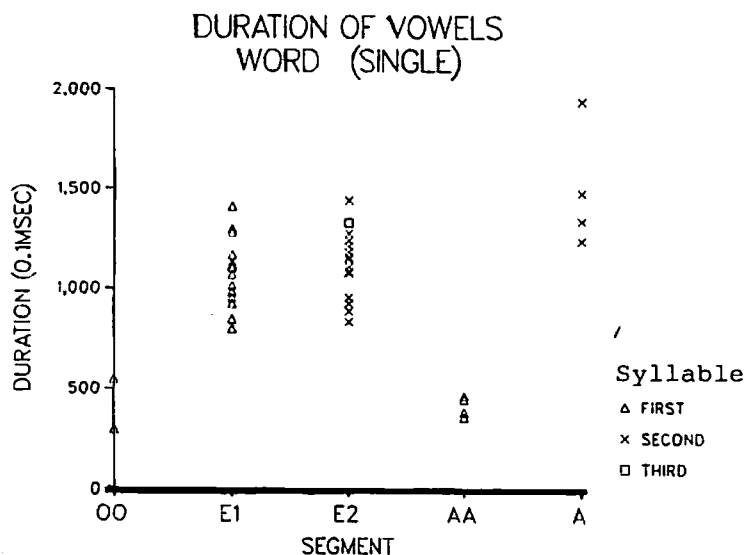


Fig. 3.1 Duration of vowels;word(single)

Fig. 3.2 Duration of vowels;word(plural)

OO; (ॐ), E1; (ॐ), E2; (ॐ), AA; (ॐ), A; (ॐ)
SHEVANA*; (ॐ), II; (ॐ)

single form of "segolate" nouns.

4. Summary

It has been said that "The vowel length is not supposed to be distinctive", and it is said "Vowels in accented syllables are longer than in unaccented ones" in modern Hebrew³). The present study may present the following results.

1. Duration of vowels observed in phonetic experiment is not parallel to the vocalization signs named as "long vowel" or "short vowel".
2. The duration of "sheva na" in the plural form of "segolate" is not shorter than the other vowels. It is more or less longer than "qamaṣ" or "ḥolam" of the first syllable.
3. The duration of "pataḥ" of the second syllable is much longer than that of "qamaṣ" of the first or the second syllable.
4. The two vowels of "segol" in "segolate" nouns are not significant statistically in regard to the duration.
5. The duration of "ḥolam" of the first syllable is much shorter despite the name of "long vowel".
6. The duration of "ḥiriq" of the final syllable is the longest of all these cases.
7. These results suggest that the duration of vowels may be controlled by the syllable which the stress falls on.

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