VOWEL DURATION IN RELATION TO STRESS PATTERNS IN ADULTS

By

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PATTERNS IN ADULTS

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PREFACE

Vowel durations of college females were studied. The durations of four vowels were taken from a controlled sample, and relationships among the vowels and between the positions were examined. The durations of the vowels were found to differ significantly from each other, and the durations were significantly longer in the final position of the sentences.

I wish to express my sincere gratitude to the individuals who assisted me in this study at Oklahoma State University. Specifically, I would like to thank my thesis adviser, Dr. Arthur L. Pentz, Jr., for his continuous guidance. I would also like to thank the other committee members, Dr. John Panagos and Dr. Nancy Monroe for their additional advice.

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CHAPTER I

INTRODUCTION

Speakers of the English language can change or alter the meaning of an utterance in numerous ways. A primary form of altering meaning occurs when phonemes are added, deleted, or reversed. When the phoneme /s/ is added to a noun, its plural form results. If the phoneme sequence "st" is reversed in the word "post", an entirely different word results. Another way the speaker may change meaning is to modify the word order of an utterance. "Brad is leaving town." becomes the question "Is Brad leaving town?" by reversing the positions of the first two words in the sentence.

The stress pattern in a phrase or sentence can also be manipulated to change meaning, without altering the word or phoneme order. This linguistic stress results either from word emphasis or as an obligation of the various conventions of the English language. For instance, the word "cat" would be stressed in the sentence "The ball hit the cat." If the word "cat" were to appear earlier in the sentence as in "The cat hit the ball." it would be in its unstressed form. Individual word stress can further enhance the semantic impact of a sentence. For example, the meaning of the sentence, "I saw a big dog." can be altered when the stress is switched from the word "big" to the word "dog" (Fromkin and Rodman, 1983).

The production of stress in a word is achieved by increasing the

frequencies (House and Fairbanks, 1953) and amplitudes (Fairbanks, House, and Stevens, 1950) of vowels and by lengthening the vowels and consonants of the sentences (Lehiste and Peterson, 1958). Vowel duration has received the most investigative attention of all the acoustic dimensions related to stress, since the length of the vowel appears to be a primary acoustic cue in the perception of whether a word or syllable is perceived as stressed or unstressed (Fry, 1955; Hixon, 1973; Klatt, 1973).

However, there are several factors in addition to word emphasis and linguistic stress which influence the durational pattern of vowels in an utterance, and their mediation may originate at any of a variety of levels in the speech production system (Klatt, 1976). Large differences in vowel duration result from anatomic and physiological constraints of the speech mechanism. The articulators vary their adjustments depending on the vowel. For example, the entire tongue has to move anteriorly and superiorly, then remain steady to produce the vowel /i/. For the vowel /a/, the tongue is only required to do a little more than relax to a natural position. In addition, Klatt (1976) reported that more effort is needed to open the jaw for the vowel /a/ in the context of a consonant than for the vowel /i/.

Other factors that affect vowel duration are phonetic and phonological constraints. The vowel will be shorter when followed by a voiceless consonant, than by a voiced consonant (Peterson and Lehiste, 1960; Klatt, 1976). The vowel /ʌ/ tends to be longer in the word "dug" than in the word "duck." Also, vowels are shorter when proceeded by plosives, and longer before fricatives (Peterson and Lehiste, 1960).

Additional factors which influence vowel duration are syntactic

constraints. Gaitenby's study (cited in Klatt, 1976) reported that syllables are longer in duration at the end of a sentence than they are at the beginning. Within the sentence, segments are longer in spontaneous speech before grammatical boundaries (Martin, 1970) and at the end of embedded or conjoined clauses (Klatt, 1976). For example, in the sentence "The girl taking the test is tired." the vowel in "test" will be longer at the completion of the embedded clause than vowels at the beginning of the embedded clause.

Semantic constraints also influence vowel duration. Old information within an utterance usually preceeds the new information (Halliday, 1967), and speakers tend to stress the new information which is typically located at the end of the sentence. "The boy hit the ball." is an English declarative where "the ball" conveys the new information putting the stress at the end of the sentence. This is a pragmatic or semantic focus whereby old and new information can be distinguished. Emphasis and contrastive stress are used in English to enhance new information (Bolinger, 1972). The speaker could also decrease the speaking rate (Kloker, 1975), and change the fundamental frequency (Klatt, 1975) to enhance an utterance.

Discourse is another factor which impacts vowel duration. Lehiste (1975), reported that in discourse, the last sentence of a paragraph that is read will contain longer durational elements than those at the beginning. Umeda (1975), found that an unusual word is longest the first time it appears in a connected discourse.

Finally, extralinguistic factors can affect vowel duration. For example, when a person speaks slowly as when he is unsure, vowel durations increase. If a person speaks faster, as when excited, the

duration of the vowel is shortened (Klatt, 1976).

A main concern of the present study is to observe how certain stress patterns of adults are affected by semantic factors, because some speakers have severe problems with these parameters. The motor impaired, the hearing impaired (Oller, 1973), and the aging population (Kent and Burkard, 1981), all have difficulty applying appropriate stress patterns. Because of inadequate respiratory support and motor control, the dysarthric and the cerebral palsied individuals may have difficulty applying the appropriate stress patterns (Hardy, 1979).

Calvert's study (cited in Whitehead, 1986) reported some hearing impaired individuals consistently lengthen vowels, and fail to demonstrate any consonant effects on vowel duration (Osberger and Levitt, 1979; Monsen, 1974). Some elderly subjects often have vowel durations that are significantly shorter than those of younger subjects due to a declining respiratory system as a result of the aging process (Ptack, Sander, Maloney, and Jackson, 1966; Kruel, 1972).

While the main thrust of the present investigation is not in regard to the previously mentioned populations, it is not known how vowel duration affects the speech in normal speaking adults. Data are needed to determine how much duration is needed for adequate stress contrast without causing the perception of overstress. Finally, it is not known if there are possible alternative acoustic changes which can improve the appropriateness of stress patterns.

This study will focus on obtaining and contrasting vowel duration dimensions of a normal adult population. Once adult normative data on stress in the form of vowel duration have been reported, other comparisons can later be made with those populations experiencing

problems with stress patterns. With this information, more appropriate therapy targets for vowel duration can be more effectively developed. Before the impaired individuals can be appropriately addressed, data concerning the vowel duration of the normal population is needed.

The purpose of the present study is to ascertain and contrast semantically and syntactically mediated vowel durations of normal adult speakers.

CHAPTER II

METHODS

Subjects

Twenty-three female college students between the ages of 18 and 25 years of age volunteered to participate in this study. Each subject participated in the informed consent process by reading information about the study, and signifying their permission to be engaged as a human subject. Each volunteer completed a questionnaire requesting information about age and any history of a communication disorder. The subjects did not participate if they were currently taking any perscriptions directed at remediation of a medical problem, or if they presented evidence of a communication disorder, vocal pathology, marked dialect, or foreign accent.

Each potential subject participated in a hearing screening, which was conducted in an acoustically treated auditory test suite. The experimenter screened at 25dB for the following frequencies: 125 Hz., 250 Hz., 500 Hz., 1000 Hz., 2000 Hz., 400 hZ., 6000 Hz., and 8000 Hz. Participation in the study was terminated, if the subject failed to pass the screening at the intensity level for two or more frequencies in either ear. Each subject was seated in an acoustically treated sound suite where tape-recorded directions were provided through two free-field speakers. The directions and the sentences were previously recorded in the sound suite using a high quality cassette tape player

with appropratelly matched microphone. The sentences to be repeated were randomly recorded, about one minute apart on each of the four cassette tapes.

Each subject was then afforded an a opportunity to ask questions after listening to the instructions. The subjects then repeated the recorded sentences which were presented through the free field speakers at 55 dB HL in the sound suite. The subject responses were tape recorded using a Sony TC-650 reel-to-reel tape recorder and appropriately matched microphone.

Target Sentences

Each sentence for the sample was constructed in such a way that it contained article, subject, verb, article, object components. The entire sample has four sentence pairs where the subject and object positions were reversed. For example, one sentence pair contained "The seed moved the weed." and "The weed moved the seed." Both had similar structures, but the subject and object were reversed in their roles in the sentence. Appendix A contains the entire sample. The remaining sentence pairs in this study included: "The cat hit the bat."; "The bat hit the cat."; "The foot fit the boot."; "The boot fit the foot."; "The spot hit the pot."; and "The pot hit the spot."

Such a sample placed the same word into the same context with two different roles in the sentences. One necessitated its production early, and one later in the same structure. Thus the effects of context variation, surrounding elements, and environment were reduced or counterbalanced. Many studies fail to control for such variations,

and hence, the specific effects of syntactic and semantic influences may have become confounded by other factors (Williams and Stevens, 1972; Lehiste, 1972; Klatt, 1976). The present, well-controlled sample enabled the investigator to carefully observe some very specific variations which can be attributed to the application of specific stress rules.

Analysis

Each subject's tape-recorded sentences were directed through a Kay Elemetrics 6061B Sonagraph sound spectrograph operating in the 16 KHZ. mode. A wideband spectrogram of each sentence was produced. The duration of the vowel was measured by the point at the onset and offset of the vowel, marked by the presence of the first and second formant transition; aspirations were included as part of the vowel only if first and second formants were well defined (House, 1961). Examples of determined onset and offset of vowels can be found in Appendix B. The vowel segments of the target words were measured. The length in millimeters was converted to duration in milliseconds, which provided the interval data necessary for parametric statistical analyzes. The measurements of each of the subject's vowel durations are contained in Appendix C. The durations were contrasted using a two-factor analysis-of-variance. The vowels /u/, /i/, /ae/, and /a/ constituted the four levels of the first repeated measure. The position of the word in the sentence (initial or final) constituted the two levels of the second repeated measure.

CHAPTER III

RESULTS

Vowel durations of the subjects were subjected to a two-factor (vowel x position) analysis-of-variance. A summary of the analysis-of-variance findings is included in Table 1.

Table 1

Analysis of Variance Summary Table

Source	Mean-Square	df	F-ratio	p
Within Groups				
Vowel				
(/ae, i, a, u/)	26585.130	3	14.402	<.05
Position (in sentence)	10290.087	1	5.575	<.05
Interaction				
Vowel x position	1062.145	1	.575	.632

The results of those analyses revealed that the vowels differed significantly from each other in duration, $F(3, 176) = 14.402$,

$p < .05$. Also, each vowel's duration changed significantly depending upon whether it appeared early or late in the sentence, $F(1, 176) = 5.575$, $p < .05$. Every vowel was shorter when it appeared early in the sentence and longer when it appeared later. The vowel x word-position interaction was not significant and permitted the comparison of each vowel's duration combined over the position factor.

WSD follow-up T-tests were used to contrast the mean durations of the vowels in both positions. The vowel /ae/ exhibited the longest duration followed by /i/, /a/, and /u/. As noted in Table 2, the overall durations for the vowels /u/ and /a/ did not differ significantly from each other. Also, the durations of /i/ and /ae/ did not differ significantly from each other. However, both /i/ and /ae/ were significantly longer than /u/ and /a/.

Table 2

Mean Durations of Vowels Combined Across Positions

Vowel	/ae/	/i/		/a/	/u/
Duration in milli-seconds	190	171	**	149	140

**Note: Means differ significantly at $p < .05$.

The individual vowel means in each sentence position are contained in Table 3.

Table 3

Summary of Cell Means and Standard Deviations

Vowel	Initial Position	Final Position
V1 /ae/	183 (SD 47)	196 (SD 29)
V2 /i/	159 (SD 55)	176 (SD 44)
V3 /a/	136 (SD 45)	162 (SD 28)
V4 /u/	132 (SD 48)	136 (SD 41)

CHAPTER IV

DISCUSSION

The results of this investigation indicated that there were significant duration differences among the vowels in adult female speakers. Statistical comparisons indicated that /ae/ exhibited the longest duration, followed by /i/, /a/, and /u/. This is probably due to the inherent differences among the vowels (Borden and Harris, 1984). All diphthongs, including /ae/ have longer duration than the vowels /a, i, u/ (Hixon, 1973). Its production consists of a steady state-transition-steady state. The vowel with the second longest duration was /i/. This vowel is a high front vowel in the vocal tract and tends to require more muscular adjustment than the vowels produced posteriorly in the vocal tract (Klatt, 1976).

The vowels /a/, and /u/ were the vowels with the shortest duration. Both were made in the back of the vowel tract, and their production required less muscular adjustment than either /i/ or /ae/. The vowels /ae/ and /i/ did not differ significantly from each other in their duration. While the diphthong /ae/ was somewhat longer than the vowel /i/, the difference was not significant. The vowel /a/ was longer than /u/, but by a far smaller nonsignificant margin than between /ae/ and /i/.

The results of this study also indicated a significant difference in the durations of the vowels, depending on the position of the

sentence. In each sentence, the vowel was longer in the final position than it was in the initial position. This finding supports the data by Gaitenby's study (cited in Klatt, 1976) which indicated that syllables at the end of a sentence are longer in duration than those within an utterance. It was found that a word at the end of the utterance would have approximately the same duration of a word in isolation and twice the duration of a word at the beginning of a sentence. Because of this prepausal lengthening, the syllable prior to the pause increases 60-200 milliseconds, with most of the increase noted in the vowels and postvocalic sonorant or fricative consonants (Oller, 1973; Klatt, 1975). Lyberg (1977) explained that a special pitch contour anticipates a boundary at the end of a breath, therefore lengthening the last vowel considerably.

Klatt (1975) reported that there is an approximate 30 percent difference in the durations of many vowels in stressed and unstressed forms. The research revealed that the vowels were 40 milliseconds longer in word-final syllables of phrase-final words than in the median position. It was unclear whether the 30 percent was evident in each individual vowel in final position versus other positions, or if the 30 percent was comprised from the differences of the vowels combined.

The present investigation found a cumulative 35 percent difference in final versus initial positions of the four vowels combined. Each vowel was longer in the final position of the sentence as in Klatt's study. This finding also concurs with Halliday (1967), who reported that speakers tend to stress the information at the end of the sentences. The present investigation further suggests that the stress used is in the form of vowel lengthening.

Much of the research concerning vowel duration has been obtained at the discourse level. The last sentence of a paragraph that is read tends to be longer than if it were not in paragraph-final position (Lehiste, 1975). These results, along with Klatt (1976) indicate that speakers tend to slow down at the end of units, regardless of whether it is at the sentence or paragraph level. A general deceleration in speaking rate is a strategy that may be used by speakers to clearly emphasize an entire phrase or clause (Kloker, 1975), or simply a natural reaction to slow down at the end of a unit.

The present investigation provided new information concerning vowel duration that can be beneficial when compared to other research. It appears that when durations are obtained from a very controlled sentence sample, the results are similar to durations obtained at the discourse level. It also appears that results gathered from a large number of subjects agree with studies that dealt with fewer subjects. From the large sample gathered in this study, data concerning group variability and standard deviations were established.

CHAPTER V

SUMMARY

Tape recorded samples of the speech of 23 female subjects were used to study the duration of vowels. Each vowel was placed at the beginning and ending of sentences in order to compare the positions.

The durations of the vowels were determined, and an analysis of variance contrasting those values revealed the following: first, the vowels differed significantly from each other in duration. The /ae/ was the longest, /i/ the next longest, then /a/ and /u/ becoming progressively shorter. Second, regardless of the vowel, its duration changed significantly depending upon whether it occurred early or late in the sentence. Those in an earlier sentence position were shorter in duration than those which were in a later position.

The current information would indicate that in carefully isolated sentences using subject, verb, object components, that groups of speakers do alter their stress patterns in ways that are similar to those used in discourse samples. Speakers lengthen the duration of the vowels on the information that is placed at the end of the sentence. Previous research has indicated that speakers tend to slow down at the end of discourse units, and this investigation further suggests that speakers alter the duration of vowels even at the sentence level.

However, the present results would also seem to indicate that the amount of lengthening in the sample, which simply provides for the

mediation of one single stress rule, differs little from the patterns observed in discourse samples which by their very nature have confounding influences operating simultaneously. Most indications are that stress rules which occur at the same time will result in some additional or supplemental lengthening. Later investigations will need to address this discrepancy which could be due to differences in methods of comparison used among a variety of investigators, or may be due to an artifact of the present methods of stimulus presentation or analysis.

Further investigation is also needed to determine differences in vowel duration patterns among adult male and female speakers, adult and younger speakers, younger and older adult speakers, and also those patterns present in a variety of speakers with other impairments, such as hearing impairment and dysarthria. As more data are accumulated, the differences among speaker groups can then be used to formulate intervention strategies which are more effective in their impact upon the overall intelligibility of oral speech of those groups. Further data should also provide a far better understanding of the ways in which the speech production system operates at different levels of mediation to insure that the mechanism is used to attach the various kinds of complex information to the oral utterance.

REFERENCES

Bolinger, D. (1972). Accent is predictable (if you're a mindreader). Language, 48, 633-644.

Borden, G. J. & Harris, K. S. (1984). Speech science primer: Physiology, acoustics, and perceptions of speech (2nd ed.). Baltimore: Williams & Wilkins.

Calvert, D. R. (1961). Some acoustic characteristics of the speech of profoundly deaf individuals. Ph.D. dissertation, Stanford University.

Fairbanks, G., House, A.S., and Stevens, E. L. (1950). An experimental study of vowel intensities. Journal of Acoustical Society of America, 22(4), 457-459.

Fromkin, V. & Rodman, R. (1983). An introduction to language (3rd ed.). C. B. S. College Pubishing.

Fry, D. B. (1955). Duration and intensity as physical correlates of linguistic stress. Journal of the Acoustical Society of America, 27(4), 765-768.

Gaitenby, J. (1965). The elastic word: Status report on speech research SR-2. Unpublished manuscript, Haskins Laboratories, New York.

Halliday, M. A. K. (1967). Comprehension of sentences. In J. Kagan (Ed.), Psychology and Language: An introduction to psycholinguistics (pp. 43-87). New York: Harcourt Brace Jovanovich.

Hardy, J. C. (1979). Celebral palsy. Englewood Cliffs, NJ: Prentice-Hall.

Hixon, T. J. (1973). Respiratory function in speech. In F. D. Minifie, T. J. Hixon, F. Williams (Eds.). Normal aspects of speech, hearing, and language. Englewood Cliffs: Prentice-Hall.

House, A. S. (1953). The influence of consonant environment upon the secondary acoustical characteristics of vowels. Journal of Acoustical Society of America, 25, 105-113.

House, A. S. (1961). On vowel duration in english. Journal of Acoustical Society of America, 33(9), 1174-1178.

Kent, R. D., & Burkard, R. (1981). Changes in the acoustic correlates of speech production. In D. S. Beasley & G. A. Davis (Ed.), Aging communication processes and disorders (pp. 47-63). New York: Grune & Stratton.

Klatt, D. H. (1973). Interaction between two factors that influence vowel duration. Journal of Acoustical Society of America, 54, 1102-1104.

Klatt, D. H. (1975). Vowel lengthening is syntactically determined in a connected discourse. Journal of Phonetics, 3, 129-140.

Klatt, D. H. (1976). Linguistic uses of segmental duration in English: Acoustic and perceptual evidence. Journal of Acoustical Society of America, 59, 1208-1221.

Kloker, D. (1975). Vowel and sonorant lengthening as cues to phonological phrase boundaries. Journal of Acoustical Society of America, 57, 533 (A).

Kruel, E. (1972). Neuromuscular control examination (NMC) for parkinsonism: Vowel prolongations and diadochokinetic and reading rates. Journal of Speech and Hearing Research, 15, 72-83.

Lehiste, I. (1972). The timing of utterances and linguistic boundaries. Journal of Acoustical Society of America, 51, 2018-2024.

Lehiste, I. (1975). The phonetic structure of paragraphs. In A. Cohen & S. Nooteboom (Eds.), Structure and process in speech perception. Heidelberg: Springer-Verlag.

Lehiste, I. & Peterson, G. E. (1958). Vowel amplitude and phonemic stress in American English. Journal of the Acoustical Society of America, 31 (4), 428-435.

Lyberg, B. (1977). Final lengthening-partly a consequence of restrictions on the speed of fundamental frequency change? Journal of Phonetics, 7, 187-196.

Martin, J. G. (1970). On judging pauses in spontaneous speech. Journal of Verbal Learning and Verbal Behavior, 9, 75-78.

Monsen, R. B. (1974). Durational aspects of vowel production in the speech of deaf children. Journal of Speech and Hearing Research, 17, 386-398.

Oller, D. K. (1973). The effect of position in utterance of speech segment duration in English. Journal of Acoustical Society of America, 54, 1235-1247.

Osberger, M. J., & Levitt, H. (1979). The effect of timing errors on the intelligibility of deaf children's speech. Journal of Acoustical Society of America, 66, 1316-1324.

Peterson, G. E. & Lehiste, I. (1960). Duration of syllable nuclei in English. Journal of Acoustical Society of America, 32(6), 693-703.

Ptacek, P., Sander, E., Maloney, W., & Jackson, C. (1966). Phonatory and related changes with advanced age. Journal of Speech and Hearing Research, 9, 353-360.

Umeda, N. (1975). Vowel duration in English. Journal of Acoustical Society of America, 58, 434-445.

Whitehead, R. L. (1986). Consonant influences on vowel duration as a function of speech intelligibility for hearing-impaired individuals. Journal of Acoustical Society of America, 79(6), 2084-2087.

Williams, C. & Stevens, K. (1972). Emotions and speech: Some acoustical correlates. Journal of Acoustical Society of America, 52(4), 1328-1250.

APPENDIXES

APPENDIX A

SAMPLE SENTENCES

1. The seat held the boy.
2. The cat hit the ball.
3. The pot hit the spot.
4. The boy held the seat.
5. The ball hit the cat.
6. The cat hit the bat.
7. The foot fit the boot.
8. The bat hit the cat.
9. The shoe fit the boot.
10. The seed moved the weed.
11. The boot fit the foot.
12. The weed moved the seed.
13. The boot fit the shoe.
14. The ice held the pot.
15. The pot held the ice.
16. The spot hit the pot.

1. The seat held the boy.
2. The cat hit the ball.
3. The pot hit the spot.
4. The boy held the seat.
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9. The shoe fit the boot.
10. The seed moved the weed.
11. The boot fit the foot.
12. The weed moved the seed.
13. The boot fit the shoe.
14. The ice held the pot.
15. The pot held the ice.
16. The spot hit the pot.

APPENDIX B

ONSET AND OFFSET OF VOWEL IN THE PHRASE

"THE BAT HIT THE CAT"


onset
offset
onset
offset

APPENDIX C

INDIVIDUAL VOWEL DURATIONS

SUBJECT	Vowel /u/ Position		Vowel /i/ Position		Vowel /ae/ Position		Vowel /a/ Position	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
1	79	143	219	249	90	136	121	166
2	113	106	241	196	192	196	132	162
3	98	155	109	215	155	211	19	189
4	0	0	0	256	11	264	41	226
5	170	106	128	185	189	185	166	236
6	196	163	166	181	207	204	204	166
7	177	151	109	170	181	241	170	166
8	64	158	151	113	189	166	124	166
9	143	147	204	162	181	181	151	158
10	166	117	173	196	222	151	189	124
11	155	132	177	143	196	181	158	139
12	136	109	75	68	207	189	79	136
13	158	121	102	166	189	195	151	158
14	166	155	192	151	238	204	155	170
15	132	128	173	200	181	207	136	158
16	68	173	207	211	226	192	113	151
17	136	155	147	113	285	189	86	181
18	162	196	181	192	200	204	132	147
19	75	106	196	124	200	166	151	185
20	166	102	166	177	181	204	181	143
21	132	204	181	215	197	253	151	234
22	155	143	124	166	189	195	147	117
23	196	147	226	196	207	207	166	151

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