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A Phonetic Context Analysis of General American Consonants and Vowels

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A PHONETIC CONTEXT ANALYSIS OF GENERAL AMERICAN CONSONANTS AND VOWELS

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CHAPTER I

INTRODUCTION

Probably for as long as speech clinicians have been doing articulation therapy, they have noted inconsistencies in the articulatory performance of their clients. We often find disagreement between articulation test results and clinician's and lay perceptual evaluations of conversational speech. Another type of inconsistency is the situation in which an individual misarticulates a sound in some words, but not in others. Spriestersbach and Curtis (1951) cite studies by Wellman, et al. (1931), Roe and Milisen (1942), Saylor (1949), Amidon (1941), Nelson (1945), Hale (1948), and Buck (1948) which substantiated the fact that inconsistent misarticulations occur. A more recent study by Schneider (1973) provides further substantiation. The clinician may take the position that defective articulation is a naturally variable behavioral phenomenon, which must be dealt with in therapy, and may even be taken advantage of, e.g., Van Riper's "key word" approach. Sidman (1960) provides a discussion of intrinsic versus imposed variability of behavior in general which has relevance for the speech clinician. He takes the position that behavior is not intrinsically (naturally) variable. Rather, when variability

is observed in behavior, it is a matter of imposed variability due to the set of conditions in which the behavior occurs, i.e., the variability is caused by some factor or factors in the set of conditions in which the behavior occurs. The objective of the researcher, then, is to identify possible sources of variability and to demonstrate that "variability has been imposed upon the /behavior/ by the experimental manipulation of factors suspected of having produced the variations" (p. 146). The "behavioral engineer" (which is what the speech clinician is) then utilizes the information obtained by the researcher in order to best achieve the behavioral objective.

Taking Sidman's approach, then, we must state: Articulatory behavior is lawful and orderly. Spriestersbach and Curtis (1951, p. 483) say, ". . . inconsistencies in speech sound production can hardly be attributed to chance. We must assume, therefore, that certain variables are operating in a systematic, lawful fashion." They reviewed studies by Nelson (1945), Hale (1948), and Buck (1948) and conclude that phonetic context accounts in part for inconsistent misarticulations. Schneider's (1973) study confirms this conclusion. She found that phonetic contexts of /r/, /s/, and /l/ rank order themselves in terms of "ease of production."

Phonetic context, then, is a relevant variable in articulatory behavior. As such, phonetic context should be controlled in the therapy situation. The question now becomes: How can we provide the clinician with a

practical and valid method of controlling phonetic context? McDonald (1964) took the first step in this direction. He constructed a deep test of articulation in which the production of a sound may be assessed when preceded by 20 consonants and three vowels and followed by a single vowel, and when preceded by a single vowel and followed by 22 consonants and four vowels. For example, the /pt/ blend is assessed by having the subject say the words "cup" and "tie" as one word He also developed a therapy approach based on identifying contexts in which the error sound is correctly produced on the deep test. Two-word combinations similar to those appearing on the deep test are then utilized as stimulus words. Two criticisms can be made of McDonald's approach: (1) As Schneider (1973) pointed out, the method of phonetic context analysis crosses the syllable boundary. (2) The stimulus items for both testing and therapy tend to be rather artificial. For example, we probably would not find the words "cup" and "tie" adjacent in spontaneous speech. Peterson (1972) points out that the validity of the McDonald Deep Test is questionable, particularly in view of the lack of normative data on the expected percentage of correct responses for an age level, and on the rank ordering of contexts tested in terms of difficulty. He says that data of this type would provide the clinician with more diagnostic and prognostic information.

Griffith and Miner (1973a) have analyzed the phonetic contexts of /r/, /ɝ/, /ɚ/, /l/, /s/, /z/, /ʃ/, /tʃ/, and /dʒ/ in the 1,002 most frequently occurring words on the Thorndike-Lorge (1944) word list. Their system of analysis is intrasyllabic rather than intersyllabic. They also considered syllabic position of the phoneme and the stress of the syllable in which the phoneme occurs as relevant parameters for analysis. The advantages of this system of analysis are: (1) It considers the phoneme and its phonetic context as they function in the syllable. (2) It yields phonetic context as they occur in the most frequently used words of the language. (3) It yields frequency of occurrence distributions for the phonetic contexts. Schneider (1973) found that syllabic position and syllabic stress interact to influence ease of production of phonetic contexts. The term "phonetic context," according to the Griffith-Miner system of analysis, may be viewed in a strict and a broad sense. In a strict sense, it has its traditional reference to the sounds adjacent to a given phoneme; however, this applies only to adjacent sounds within the same syllable. In a broader sense (and more importantly, in a clinical sense), phonetic context refers not only to adjacent sounds of a particular phoneme, but also to the position of the phoneme in the syllable, the stress of the syllable in which the phoneme occurs, and the frequency of occurrence of a given combination of sounds.[1] The present investigation

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[1] L. E. Miner, personal communication, December, 1973.

extended the work of Griffith and Miner to the 33 remaining phonemes of General American speech.

The results of this study, combined with those of Griffith and Miner (1973a), provide the speech clinician with the needed information to control phonetic context as a variable in articulation therapy and testing. Griffith and Miner (1973b) have suggested three such uses. First, speech pathologists who are constructing articulation tests can increase the linguistic validity of their tests by selecting test items which represent the most frequently occurring contexts in the most frequently occurring words. Second, in deep testing for any phoneme of General American, the clinician will be able to test those contexts which would be most likely to occur in the client's speech. Third, the clinician will be able to use frequency of occurrence of phonetic contexts as a variable in selecting stimulus items for therapy. The clinician's need for a phonetic context analysis for the less frequently misarticulated sounds is readily apparent when we deal with apraxia and dysarthria, which frequently involve sounds other than those most frequently misarticulated in the so-called functional articulation disorders.

Perhaps the phenomenon of phonetic context is also applicable to voice quality disorders. For instance, a common therapeutic technique for elimination of the hard glottal attack is to precede the vowel with /h/. Perhaps we could extend the concept of the deep test to voice therapy to

find the phonetic contexts which would facilitate the production of a desired voice quality.

Other disciplines may also be interested in the combined results of the Griffith and Miner (1973a) study and the present investigation. The audiologist should consider phonetic context as a relevant variable in testing and training for speech sound discrimination and speechreading. The descriptive linguist should be interested in the data merely as a contribution to the existing knowledge of speech sounds as they occur in the language. For the comparative philologist the data would provide a basis for comparison to frequency of occurrence of phonetic contexts in other languages.

Statement of Purpose

The purpose of this investigation was to analyze the phonetic contexts of each General American phoneme (excluding /r/, /ɝ/, /ɚ/, /s/, /z/, /tʃ/, /dʒ/, /l/, /ʃ/, /m̩/, /n̩/, and /l̩/) in the 1,002 most frequently occurring words of American English, and to determine the distribution of the contexts in terms of frequency of occurrence. The 33 phonemes analyzed in this study were: /p/, /b/, /t/, /d/, /k/, /g/, /f/, /v/, /θ/, /ð/, /ʒ/, /h/, /m/, /n/, /ŋ/, /w/, /hw/, /j/, /i/, /I/, /e/, /ɛ/, /æ/, /ɑ/, /ɔ/, /o/, /U/, /u/, /ə/, /ʌ/, /aI/, /aU/, and /ɔI/.

Specifically, the following questions were posed:

1. What are the phonetic contexts of each phoneme to be analyzed in the 1,002 most frequently occurring words of American English?
   a. For the consonants, what are the phonetic contexts of each phoneme as a function of consonant-vowel combinations versus consonant blends?
   b. What are the phonetic contexts of each phoneme as a function of syllabic position and syllabic stress?

2. How do the obtained phonetic contexts rank order themselves with respect to frequency of occurrence?
   a. For the consonants, how do the obtained phonetic contexts rank order themselves with respect to frequency of occurrence as a function of consonant-vowel combinations versus consonant blends?
   b. How do the obtained phonetic contexts rank order themselves with respect to frequency of occurrence as a function of syllabic position and syllabic stress?

CHAPTER II

REVIEW OF THE LITERATURE

Phonetic Context

McDonald (1964) is generally credited as the first to provide a systematic utilization of phonetic context as a clinical tool for testing and treating articulation disorders. He constructed a deep test of articulation in which the production of a sound may be assessed when preceded by 20 consonants and three vowels and followed by a single vowel, and when preceded by a single vowel and followed by 22 consonants and four vowels. For example, the /pt/ blend is assessed by having the subject say the words "cup" and "tie" as one word. He also developed a therapy approach based on identifying contexts in which the error sound is correctly produced on the deep test and utilizing two-word combinations similar to those appearing on the deep test. Criticisms of McDonald's approach were pointed out in the previous chapter.

Actually, it seems that McDonald was preceded by Van Riper and Irwin (1958), at least in the conception of a phonetic context approach to articulation therapy. In commenting on the implications of Stetson's (1951) research on the syllable, Van Riper and Irwin state:

> We should concentrate our therapy on the syllable rather than the isolated sound; we should focus our efforts upon the sequential movement patterns rather than the acoustic impressions that result from them; we should give the motor phonetic context of the misarticulation the attention it deserves (p. 161).

In the following paragraph they go on to say:

> In implementing such a program in practical therapy an intensive articulation testing program is required. All phonetic contexts of the misarticulated sound should be explored, and therapy should begin with the syllable that is most nearly correct in the subject's normal utterance (p. 161).

Of course Van Riper and Irwin do not recommend the phonetic context approach to the exclusion of other approaches. However, they do offer clinical evidence that the method is effective, especially with those cases in which misarticulations are inconsistent.

In Building Basic Articulation Skills, Griffith and Miner (1973a) have provided a phonetic context analysis of the nine most frequently misarticulated phonemes as they occur in the 1,002 most frequently occurring words. They also considered the obtained contexts in terms of the syllabic position of the phoneme and the stress of the syllable in which the phoneme occurs. The first 1,002 words of the Thorndike-Lorge (1944) 10,000 most frequently occurring words was used for this analysis. Griffith and Miner suggest that the clinician utilize the obtained phonetic context in which the error sound is correct or nearly correct. The clinician is then able to select stimulus words for therapy which are most likely "to produce correct articulation of a sound in the shortest possible time" (p. 23).

Griffith and Miner (1973b) have investigated the relationship between phonetic context and Zipf's Law. Zipf (1965) found that there is an inverse relationship between word length and word frequency. Griffith and Miner hypothesized and confirmed that if words rank order themselves in terms of frequency of occurrence, then phonetic contexts also do so. They also provide further insights into the relevance of phonetic context to articulation testing and therapy. It is suggested that concentrating on the most frequently occurring contexts in the assessment of articulatory performance would "align the testing situation with the demands for language usage placed on the child" (p. 2). In reviewing the stimulus items used on nine commonly used articulation tests, Griffith and Miner conclude that frequency of occurrence of phonetic contexts has not been taken into account in constructing such tests. With respect to therapy, and specifically selection of stimulus words for therapy, it is stated: "For the child with an articulation disorder, mastery of the major phonetic contexts gives him greater opportunities for communicative success" (p. 3).

Schneider (1973) investigated the relationship between phonetic context and articulation ability. Using the most frequently occurring contexts as found by Griffith and Miner (1973a), she administered a deep test of /r/, /s/, and /l/ to /r/-, /s/-, and /l/-defective children respectively. She found that the contexts of each phoneme rank ordered

themselves in terms of the percentage of children who articulated the sound correctly in a particular context. It was further concluded that neither syllabic position or stress when acting alone influenced the rank ordering of contexts, but rather "an interaction of these parameters was a greater determining factor in the rank ordering" (p. 43). Schneider also investigated the relation between her obtained rank ordering of phonetic contexts for frequency of occurrence. She found that the two rank orders were not related: "The most frequently occurring phonetic contexts were not produced correctly more frequently nor were they the least correctly produced" (p. 46). Schneider concludes: "Phonetic context and articulation ability are clearly related in that certain contexts facilitate correct production, whereas, other contexts tend to inhibit correct production. The value of deep tests of articulation has been substantiated in this investigation" (p. 62).

The Syllable

Stetson (1951) has shown that the syllable is the basic unit of speech as it is produced. He found that the syllable was composed of three parts or "factors": (1) a "releasing factor," (2) a "vowel shaping factor," and (3) an "arresting factor." The releasing of the syllable may be accomplished by a chest pulse (contraction of the intercostal muscles causing a rapid rise in pressure) alone or in combination with a "consonant movement." The arresting factor may be a chest pulse alone, a

consonant alone, or a chest pulse and consonant movement in combination. Vowel shaping is accomplished by shaping the vocal tract for a particular vowel. This analysis yields four possible types of syllables: OVO, CVO, OVC, and CVC where O represents the chest pulse, V the vowel, and C the consonant.

The factors of the syllable, then, are the phonemes. It is Stetson's point, however, that the phonemes are not produced independent of the syllable, i.e., in speech as it is produced, phonemes do not exist in and of themselves, but only as a part of the syllable which they form. Stetson says: "They may be named as if separate /ēntitiēs/, but that is merely a convenient abstraction" (p. 8). Thus, consonants function to release or arrest a syllable and vowels function to shape the vocal tract for the syllabic pulse.

Stetson concluded that speech, as it is produced, is organized as follows:

> Any utterance however simple has the essential movement units: the syllable is an integration of the three syllable factors; the syllable or syllables are components of a foot; the foot or feet are components of a breath group; the breath group or breath groups compose a phrase (p. 10).

Each of the units represents a physiological entity or movement that occurs during speech. All of the movement units occur in an utterance whether it consists of one syllable or many.

Keenan (1961) has criticized the traditional classification of phonemes as being in the initial, medial, or final position of words. He points out that when a phoneme is said to be in the medial position of a word, we are actually saying only that sound "is neither the first nor the last sound in that word" (p. 171). He further points out that, within its syllable, the "medial" sound may function in a variety of phonetic contexts, in different syllabic positions, and in syllables with differing stress. As clinical evidence of the problems caused by the medial word position category, he gives a case history in which inconsistent articulations of a "medial" /g/ and /k/ were observed. Further analysis of the subject's production of the sounds in various words revealed that syllabic position and stress seemed to be relevant variables in the subject's articulations of the sounds. To eliminate the vagueness caused by the medial word position classification, Keenan recommends that consonants be considered only in terms of their function in their syllable, i.e., prevocalic and postvocalic. A third category, intervocalic, is recommended for "consonants which cannot be unequivocably placed with either the preceding or the following vowel" (p. 173). However, it is obvious that the intervocalic classification crosses the syllable boundary, and thus contradicts Keenan's basic recommendation.

The Phoneme

Zipf (1965), in advancing his principle of economy of time and effort

from the word to the phoneme, concluded that the frequency of occurrence of a phoneme is inversely related to the "magnitude of complexity" of the phoneme. He pointed out that the phoneme, unlike the word, is the smallest unit of distinctive significance in speech and thus, very difficult to quantify in terms of complexity. Zipf was obviously attempting to establish aspects of the phoneme which were analogous to the length of words. He resorted to an analysis of phonemes very similar to the distinctive features analysis of today (it should be pointed out here that Zipf's book was originally published in 1935). He viewed phonemes as "constellations,or configurations, of articulatory sub-gestures, arranged partly or completely in sequential order, some sequences running concurrently with others . . ." (p. 60). To evaluate the relative complexity of phonemes, pairs of phonemes were selected which had the "essential sequences" in common, but differed by one element: (1) aspirated and unaspirated stops, (2) lenes and fortes stops, and (3) voiceless and voiced stops. The unaspirated, lenes, and voiceless stops respectively, were in Zipf's view, the less complex of each pair, and therefore, should occur more frequently than their cognates. The aspirated—unaspirated stops and lenes—fortes stops in Peipingese Chinese, Danish, Cantonese Chinese, and Burmese were compared for frequency of occurrence in the language. In all instances, except for one phoneme pair in Burmese, the unaspirated and lenes stops occurred with greater

relative frequency. Voiced and unvoiced stops in 12 different languages (including English) were compared for frequency of occurrence in the language. Out of 35 comparisons made, in only two instances did the voiced stop occur with greater relative frequency than the voiceless stop.

Dewey (1923) conducted a word, syllable, and phoneme count based on a 100,000 word sample taken from printed material. Of particular interest to the present study are the results of Dewey's data on the frequency of occurrence of speech sounds. His word count yielded 10,119 different words, of which 1,027 occurred more than ten times each. Each of these 1,027 words was transcribed phonetically using the "Revised Scientific Alfabet." The Revised Scientific Alfabet differs from the current International Phonetic Association (IPA) alphabet in that it does not recognize the consonant /hw/ and the vowels /ɝ/ and /ɚ/, while recognizing 14 other pure vowels in contrast to the IPA's 12. The occurrence of a phoneme in a word was weighted by the number of times the word appeared in the sample. Dewey found that of the 372,729 occurrences of phonemes in his sample, 62.10% of them were consonants and 37.90% vowels and diphthongs. The ten most frequently occurring consonants of Dewey's study will be compared with those of the present study in Chapter IV. The vowels of Dewey's study will not be compared because of incompatibility with the IPA alphabet.

French, Carter, and Koenig (1930) performed an analysis similar to Dewey's based on a total sample of 79,390 words derived from telephone

conversations in New York City. Their word count yielded 2,240 different words. Each of the words was then transcribed phonetically using the pronunciation which the authors "regarded as being the typical pronunciation heard in reasonably enunciated conversation among educated persons in New York" (pp. 310-311). The particular phonetic alphabet used was not specified; however, it was not the IPA alphabet. Once the words had been transcribed, the sounds comprising each word were weighted by the number of times the word occurred in the total sample. Thus, the frequency of occurrence of sounds was calculated on the basis of the frequency of occurrence of the sound in the total 79,390 word sample. The authors reported their relative frequency data under three headings: vowels, initial consonants, and final consonants. The vowels were further subdivided into accented and unaccented. The two consonant categories were further subdivided into simple (singles) and compound (blends).

Fletcher (1953) presents an adaptation of the French et al. data in which he has combined the initial--final and simple--compound classifications. The ten most frequently occurring consonants resulting from Fletcher's adaptation are compared with those of the present in Chapter IV.

Tobias (1959) recognized a limitation of the French et al. (1930) study: the transcription of the words according to the authors' (who were engineers) notions of typical pronunciation of educated persons in New

York rather than according to General American pronunciation as recognized by a competent authority. Tobias retranscribed the French et al. word lists according to the General American pronunciation as given by Kenyon and Knott (1953). In those instances where more than one acceptable pronunciation was given, "equal weight was arbitrarily given to each pronunciation" (p. 631). Tobias further adapted the French et al. data to the IPA alphabet for comparison with his results. He concludes from the comparison that for the "general user . . . there is no grave risk in accepting most of the French, Carter, and Keonig tabulation . . ." (p. 631). However, for those who must use "more stringent criteria" he suggests use of his tabulation. The ten most frequently occurring phonemes, the ten most frequently occurring consonants, and the five most frequently occurring vowels of Tobias' tabulation and his adaptation of the French et al. data are compared with those of the present study in Chapter IV.

Mader (1954) investigated the relative frequency of occurrence of phonemes in the speech of first, second, and third grade school children. The speech samples were obtained through directed interviews with the children. Analysis of frequency of occurrence of phonemes was done in a manner similar to French et al. (1930), except that pronunciations as given by the "Webster's Collegiate Dictionary" were used. Mader's ten most frequently occurring consonants are compared with those of the present study in Chapter IV.

Faircloth and Faircloth (1973) cite previous research by S. R. Faircloth (1970) on the frequency of occurrence of phonemes. No details concerning the methodology used in the study are given, except to say that "a phonological analysis of the spontaneous natural language of a group of normally speaking subjects" was performed (Faircloth and Faircloth, 1973, p. 17). Rank orders of the vowels and of the consonants based on frequency of occurrence are given. The ten most frequently occurring consonants and the five most frequently occurring vowels are compared with those of the present study in Chapter IV.

Summary

The literature cited indicated that phonetic context is a relevant variable in articulatory behavior and should be a primary consideration in the selection of stimuli for articulation testing and therapy. The syllable was seen as the valid unit of analysis for phonetic context. Moreover, the function of phonemes in the syllable and the stress of the syllable were shown to be essential factors to be considered in phonetic context analysis. It was found that words, phonemes, and phonetic contexts rank-order themselves in terms of frequency of occurrence. The literature further indicated that frequency of occurrence of phonetic contexts is an important consideration from both a linguistic and a clinical point of view.

CHAPTER III

PROCEDURES

For purposes of this study, the syllable was considered the valid unit of analysis for phonetic context. Using Stetson's (1951) model of the elements of the syllable, consonants or consonant blends either release (herein termed "initial") or arrest (herein termed "final") the syllable. Vowels may occur in the initial, medial, or final position of the syllable. The phonetic context of a consonant occurring as a single would be consonant + vowel (CV) or vowel + consonant (VC), depending on the function of the consonant in the syllable. The phonetic context of a consonant occurring in a blend would be the blend itself. The phonetic context of a vowel which occurs in the initial or final syllable position would be the consonant following or preceding it, respectively. Vowels which occur in the medial syllable position, would have as their phonetic context the consonant preceding them. Only two degrees of syllabic stress were recognized in this study: when the syllable received the primary stress of a word, it was designated "accented"; all other syllables were designated "unaccented."

The 1,002 most frequently occurring words used for this study were those of the Thorndike-Lorge (1944) list of most frequently occurring words. Griffith and Miner (1973b) have justified the use of the Thorndike-Lorge list over the many word frequency counts available. They cite an 80 to 90 percent agreement between the first 1000 words on the Thorndike-Lorge list and other lists. "The lack of complete (100%) agreement can be attributed to sampling error. Since the Thorndike-Lorge study was one of the largest and therefore, has a smaller sampling error, it was chosen as the preferred list for generating phonetic context frequency data" (p. 4).

Griffith and Miner (1973c) have analyzed the 1,002 most frequently occurring Thorndike-Lorge words according to the occurrence of a particular phoneme in a word, the syllabic position of the phoneme, and the stress of the syllable in which the phoneme occurs. The present investigator utilized the Griffith and Miner word lists as his source for words to be analyzed.

The following procedure was used in the analysis: (1) The words containing a particular phoneme were located in the Griffith-Miner lists. (2) Each word was written in the center of a 3"x 5" card. (3) The syllabic position of the phoneme and the stress of the syllable in which the phoneme occurred was noted in the lower left corner of the card. (4) The phonetic context of the phoneme was determined, using the first pronunciation given by Kenyon and Knott (1953) for the word. (5) The phonetic

context of the phoneme was noted in the upper left corner of the card. (6) The cards obtained for a particular phoneme were sorted according to context and syllabic position and stress. (7) The cards obtained from the sorting were counted. (8) The frequencies of contexts were recorded according to syllabic position and stress.

One departure was taken from the Griffith and Miner (1973c) analysis. In considering words containing /j/ followed by /u/, for example, "news," Griffith and Miner regard both the /j/ and the /u/ as being in the medial syllabic position. Having a consonant occur in the medial position, however, is not compatible with the syllabic model used in the present study. Kenyon and Knott (1953) state:

> /ju/ would not be separately listed as a vowel symbol, being a consonant plus vowel, except for comparison with the diphthong /Iu/, with which it often alternates, for /ju/ is of the same nature as other combinations of consonantal /j/ plus a vowel (as in "ye" /je/, "yaw" /jɔ/, "yet" /jɛt/, etc.) or of consonantal /w/ plus a vowel ("we" /wi/, "way" /we/, "woe"/wo/, etc.). (p. xx)

Therefore, for purposes of this study, /ju/ was considered as any other consonant plus vowel. In the word "news," for example, /j/ was considered as part of the /nj/ blend in the initial position.

CHAPTER IV

RESULTS AND DISCUSSION

The phonetic context distributions of each of the 33 phonemes analyzed are reported in this chapter. In addition, the phonetic context distributions derived by Griffith and Miner (1973a) for /r/, /ɝ/, /ɚ/, /l/, /s/, /z/, /ʃ/, /tʃ/, and /dʒ/ are reported. The combination of these two sets of data represents the phonetic context distributions for all General American phonemes except /m̥/, /n̥/, and /l̥/.

The data of the present study and those of Griffith and Miner (1973a) were further subjected to the following descriptive analyses: (1) high- and low-frequency vowel contexts of consonants, (2) frequency of occurrence of phonemes, and (3) distribution of consonants on syllabic variables. The results of these analyses are reported.

Frequency Distributions of Phonetic Contexts

The frequency distributions of phonetic contexts for each phoneme are shown in Tables 1 through 42. The contexts are presented in rank order according to frequency of occurrence in each of the position/stress categories (Initial/Accented, Initial/Unaccented, Medial/Accented,

Medial/Unaccented, Final/Accented, and Final/Unaccented). Table for consonants that occur with both vowels and consonants are subdivided into their vowel contexts and blend contexts.

TABLE 1a.--/p/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[pe]	6	6	15.00	15.00
[pɪ]	5	11	12.50	27.50
[pæ]	5	16	12.50	40.00
[pɛ]	5	21	12.50	52.50
[po]	4	25	10.00	62.50
[pi]	3	28	7.50	70.00
[pʊ]	3	31	7.50	77.50
[pɛ]	2	33	5.00	82.50
[pɚ]	2	35	5.00	87.50
[paʊ]	2	37	5.00	92.50
[pɔ]	1	38	2.50	95.00
[pʌ]	1	39	2.50	97.50
[pɔɪ]	1	40	2.50	100.00
		I/UA		
[pə]	4	4	33.33	33.33
[pɚ]	4	8	33.33	66.66
[pɨ]	3	11	25.00	91.66
[pɐ]	1	12	8.33	100.00
		F/A		
[ɑp]	5	5	22.73	22.73
[ip]	3	8	13.64	36.37
[ɪp]	3	11	13.64	50.01
[æp]	3	14	13.64	63.65
[ep]	2	16	9.09	72.74
[ʌp]	2	18	9.09	81.83

TABLE 1a--Continued

Context	f	Cf	%	Cum. %
[ɛp]	1	19	4.55	86.38
[op]	1	20	4.55	90.93
[up]	1	21	4.55	95.48
[aɪp]	1	22	4.55	100.00
F/UA				
[əp]	1	1	100.00	100.00

TABLE 1b.--/p/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
I/A				
[pr]	13	13	81.25	81.25
[pl]	3	16	18.75	100.00
I/UA				
[pr]	3	3	100.00	100.00
F/A				
[pt]	3	3	75.00	75.00
[ps]	1	4	25.00	100.00

TABLE 2a.--/b/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[bI]	9	9	22.50	22.50
[bɛɹ]	5	14	12.50	35.00
[bɛ]	4	18	10.00	45.00
[bi]	3	21	7.50	52.50
[be]	3	24	7.50	60.00
[bo]	3	27	7.50	67.50
[bʌ]	3	30	7.50	75.00
[bæ]	2	32	5.00	80.00
[bɝ]	2	34	5.00	85.00
[baI]	2	36	5.00	90.00
[bɔ]	1	37	2.50	92.50
[bU]	1	38	2.50	95.00
[baU]	1	39	2.50	97.50
[bɔI]	1	40	2.50	100.00
		I/UA		
[bI]	10	10	45.45	45.45
[bə]	5	15	22.73	68.18
[bɚ]	4	19	18.18	86.36
[bɨ]	3	22	13.64	100.00
		F/A		
[ʌb]	5	5	62.50	62.50
[æb]	3	8	37.50	100.00

TABLE 2b.--/b/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[br]	10	10	62.50	62.50
[bl]	4	14	25.00	87.50
[bj]	2	16	12.50	100.00
		I/UA		
[bl]	1	1	50.00	50.00
[bj]	1	2	50.00	100.00

TABLE 3a.--/t/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[te]	6	6	17.65	17.65
[tI]	5	11	14.71	32.36
[tɛ]	4	15	11.76	44.12
[taI]	4	19	11.76	55.88
[tu]	3	22	8.82	64.70
[ti]	2	24	5.88	70.58
[tɔ]	2	26	5 88	76.46
[to]	2	28	5.88	82.34
[tɹ]	2	30	5.88	88.22
[tɑ]	1	31	2.94	91.16
[tU]	1	32	2.94	94.10
[tʌ]	1	33	2.94	97.04
[taU]	1	34	2.94	100.00

TABLE 3a.--Continued

Context	f	Cf	%	Cum. %
		I/UA		
[tɪ]	13	13	30.95	30.95
[tɚ]	13	26	30.95	61.90
[tə]	8	34	19.05	80.95
[tɒ]	4	38	9.52	90.47
[tɻ]	2	40	4.76	95.23
[tu]	1	41	2.38	97.61
[taɪ]	1	42	2.38	100.00
		F/A		
[aɪt]	12	12	13.48	13.48
[it]	11	23	12.36	25.84
[ɪt]	10	33	11.24	37.08
[et]	10	43	11.24	48.32
[ɛt]	9	52	10.11	58.43
[æt]	8	60	8.99	67.42
[at]	7	67	7.87	75.29
[ot]	5	72	5.62	80.91
[aʊt]	5	77	5.62	86.53
[ɔt]	4	81	4.49	91.02
[ʌt]	3	84	3.37	94.39
[ʊt]	2	86	2.25	96.64
[ut]	2	88	2.25	98.89
[ɝt]	1	89	1.12	100.00
		F/UA		
[ɒt]	6	6	42.86	42.86
[ɪt]	4	10	28.57	71.43
[at]	2	12	14.29	85.72
[ut]	1	13	7.14	92.86
[ɚt]	1	14	7.14	100.00

TABLE 3b.--/t/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[st]	19	19	46.34	46.34
[tr]	12	31	29.27	75.61
[str]	7	38	17.07	92.68
[tw]	3	41	7.32	100.00
		I/UA		
[tr]	3	3	100.00	100.00
		F/A		
[st]	19	19	28.36	28.36
[nt]	16	35	23.88	52.24
[rt]	10	45	14.93	67.17
[kt]	5	50	7.46	74.63
[lt]	4	54	5.97	80.60
[ts]	4	58	5.97	86.57
[pt]	3	61	4.48	91.05
[ft]	3	64	4.48	95.53
[kst]	1	65	1.49	97.02
[mpt]	1	66	1.49	98.51
[nst]	1	67	1.49	100.00
		F/UA		
[nt]	6	6	60.00	60.00
[st]	3	9	30.00	90.00
[kt]	1	10	10.00	100.00

TABLE 4a.--/d/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[dI]	7	7	19.44	19.44
[de]	5	12	13.89	33.33
[di]	4	16	11.11	44.44
[d^]	4	20	11.11	55.55
[dɛ]	3	23	8.33	63.88
[dɑ]	3	26	8.33	72.21
[dɔ]	2	28	5.56	77.77
[do]	2	30	5.56	83.33
[daU]	2	32	5.56	88.89
[dæ]	1	33	2.78	91.67
[du]	1	34	2.78	94.45
[dU]	1	35	2.78	97.23
[daI]	1	36	2.78	100.00
		I/UA		
[dI]	10	10	40.00	40.00
[də]	6	16	24.00	64.00
[dɚ]	6	22	24.00	88.00
[dɒ]	2	24	8.00	96.00
[do]	1	25	4.00	100.00
		F/A		
[ɛd]	11	11	17.74	17.74
[aId]	11	22	17.74	35.48
[Ud]	7	29	11.29	46.77
[ed]	6	35	9.68	56.45
[id]	5	40	8.06	64.51
[æd]	4	44	6.45	70.96
[^d]	4	48	6.45	77.41
[ɝd]	4	52	6.45	83.86
[Id]	3	55	4.84	88.70
[ad]	2	57	3.23	92.93

TABLE 4a.--Continued

Context	f	Cf	%	Cum. %
[ud]	2	59	3.23	95.16
[aUd]	2	61	3.23	98.39
[od]	1	62	1.61	100.00
F/UA				
[ɘd]	5	5	45.45	45.45
[ɚd]	3	8	27.27	72.72
[Id]	1	9	9.09	81.81
[od]	1	10	9.09	90.90
[ɒd]	1	11	9.09	100.00

TABLE 4b.--/d/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
I/A				
[dɾ]	7	7	70.00	70.00
[dj]	3	10	30.00	100.00
L/UA				
[dɾ]	2	2	100.00	100.00
F/A				
[nd]	22	22	51.16	51.16
[ld]	13	35	30.23	81.39
[rd]	8	43	18.60	100.00
F/UA				
[nd]	3	3	100.00	100.00

TABLE 5a.--/k/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[kʌ]	9	9	18.74	18.75
[kæ]	8	17	16.67	35.42
[kɔ]	7	24	14.58	50.00
[kɑ]	5	29	10.42	60.42
[ko]	5	34	10.42	70.84
[kɪ]	4	38	8.33	79.17
[ke]	2	40	4.17	83.34
[kɛ]	2	42	4.17	87.51
[kʊ]	2	44	4.17	91.68
[ki]	1	45	2.08	93.76
[ku]	1	46	2.08	95.84
[kaɪ]	1	47	2.08	97.92
[kaʊ]	1	48	2.08	100.00
		I/UA		
[kə]	9	9	64.29	64.29
[kɨ]	3	12	21.43	85.72
[kɪ]	1	13	7.14	92.86
[ke]	1	14	7.14	100.00
		F/A		
[ɛk]	6	6	16.22	16.22
[ɪk]	5	11	13.51	29.73
[ek]	5	16	13.51	43.24
[æk]	4	20	10.81	54.05
[ʊk]	4	24	10.81	64.86
[ik]	3	27	8.11	72.97
[ak]	3	30	8.11	81.08
[ok]	3	33	8.11	89.19
[ɔk]	2	35	5.41	94.60
[ɚk]	1	36	2.70	97.30
[aɪk]	1	37	2.70	100.00

TABLE 5a.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[Ik]	8	8	80.00	80.00
[ək]	2	10	20.00	100.00

TABLE 5b.--/k/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[kl]	10	10	37.04	37.04
[kw]	6	16	22.22	59.26
[kr]	5	21	18.52	77.78
[sk]	5	26	18.52	96.30
[skw]	1	27	3.70	100.00
		F/A		
[kt]	5	5	29.41	29.41
[nk]	4	9	23.53	52.94
[rk]	3	12	17.65	70.59
[ks]	2	14	11.76	82.35
[sk]	1	15	5.88	88.23
[lk]	1	16	5.88	94.11
[kst]	1	17	5.88	100.00
		F/UA		
[kt]	1	1	100.00	100.00

TABLE 6a.--/g/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[gɛ]	6	6	20.69	20.69
[gæ]	5	11	17.24	37.93
[ge]	4	15	13.79	51.72
[go]	4	19	13.79	65.51
[gɪ]	3	22	10.34	75.85
[gæ]	2	24	6.90	82.75
[gɔ]	1	25	3.45	86.20
[gʊ]	1	26	3.45	89.65
[gʌ]	1	27	3.45	93.10
[gɝ]	1	28	3.45	96.55
[gaɪ]	1	29	3.45	100.00
		I/UA		
[go]	1	1	33.33	33.33
[gɚ]	1	2	33.33	66.66
[gɨ]	1	3	33.33	100.00
		F/A		
[ɪg]	2	2	28.57	28.57
[ɛg]	2	4	28.57	57.14
[æg]	1	5	14.29	71.43
[ɔg]	1	6	14.29	85.72
[Ug]	1	7	14.29	100.00
		F/UA		
[ɪg]	1	1	50.00	50.00
[ɔg]	1	2	50.00	100.00

TABLE 6b.--/g/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[gr]	11	11	84.62	84.62
[gl]	2	13	15.38	100.00
		I/UA		
[gl]	2	2	100.00	100.00

TABLE 7a.--/f/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[fɪ]	8	8	14.81	14.81
[fɔ]	7	15	12.96	27.77
[fɑ]	6	21	11.11	38.88
[faɪ]	6	27	11.11	49.99
[fɛ]	5	32	9.26	59.25
[fe]	4	36	7.41	66.66
[fæ]	4	40	7.41	74.07
[fo]	4	44	7.41	81.48
[fi]	3	47	5.56	87.04
[fʊ]	2	49	3.70	90.74
[fu]	2	51	3.70	94.44
[fɚ]	2	53	3.70	98.14
[faʊ]	1	54	1.85	100.00

TABLE 7a.--Continued

Context	f	Cf	%	Cum. %
		I/UA		
[fə]	2	2	50.00	50.00
[fo]	1	3	25.00	75.00
[fɚ]	1	4	25.00	100.00
		F/A		
[æf]	1	1	100.00	100.00
		F/UA		
[æf]	1	1	100.00	100.00

TABLE 7b.--/f/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[fɹ]	9	9	56.25	56.25
[fl]	4	13	25.00	81.25
[fj]	3	16	18.75	100.00
		F/A		
[lf]	5	5	62.50	62.50
[ft]	3	8	37.50	100.00

TABLE 8a.--/v/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[vɛ]	3	3	27.27	27.25
[vI]	2	5	18.18	45.45
[vɛ]	2	7	18.18	63.63
[vaI]	2	9	18.18	81.81
[vo]	1	10	9.09	90.90
[vɔI]	1	11	9.09	100.00
		I/UA		
[vɚ]	3	3	60.00	60.00
[vI]	1	4	20.00	80.00
[və]	1	5	20.00	100.00
		F/A		
[ɛv]	10	10	27.03	27.03
[ʌv]	5	15	13.51	40.54
[iv]	4	19	10.81	51.35
[uv]	4	23	10.81	62.16
[aIv]	4	27	10.81	72.97
[Iv]	3	30	8.11	81.08
[ev]	3	33	8.11	89.19
[æv]	2	35	5.41	94.60
[ɑv]	1	36	2.70	97.30
[ɝv]	1	37	2.70	100.00
		F/UA		
[Iv]	1	1	100.00	100.00

TABLE 8b.--/v/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[vj]	1	1	100.00	100.00
		F/A		
[lv]	1	1	50.00	50.00
[lvz]	1	2	50.00	100.00

TABLE 9a.--/θ/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[θɪ]	3	3	42.86	42.86
[θæ]	1	4	14.29	57.15
[θɔ]	1	5	14.29	71.41
[θɝ]	1	6	14.29	85.73
[θaU]	1	7	14.29	100.00
		I/UA		
[θɪ]	3	3	75.00	75.00
[θɚ]	1	4	25.00	100.00
		F/A		
[ɛθ]	2	2	18.18	18.18
[uθ]	2	4	18.18	36.36
[ɝθ]	2	6	18.18	54.54
[aUθ]	2	8	18.18	72.72
[æθ]	1	9	9.09	81.81
[oθ]	1	10	9.09	90.90
[ʌθ]	1	11	9.09	100.00

TABLE 9b.--/θ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[θr]	2	2	100.00	100.00
		F/A		
[rθ]	2	2	66.67	66.67
[lθ]	1	3	33.33	100.00

TABLE 10.--/ð/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ðɛ]	5	5	31.25	31.25
[ði]	3	8	18.75	50.00
[ðɪ]	2	10	12.50	62.50
[ðo]	2	12	12.50	75.00
[ðɪ]	1	13	6.25	81.25
[ðe]	1	14	6.25	87.50
[ðʌ]	1	15	6.25	93.75
[ðəU]	1	16	6.25	100.00
		I/UA		
[ðər]	6	6	85.71	85.71
[ðə]	1	7	14.29	100.00
		F/A		
[ɛð]	3	3	37.50	37.50
[æð]	2	5	25.00	62.50
[ʌð]	2	7	25.00	87.50
[ɪð]	1	8	12.50	100.00
		F/UA		
[ɪð]	2	2	100.00	100.00

TABLE 11a.--/s/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[sɛ]	22	22	25.00	25.00
[sI]	12	34	13.64	38.64
[sʌ]	10	44	11.36	50.00
[si]	9	53	10.23	60.23
[saI]	9	62	10.23	70.46
[sɹ]	6	68	6.82	77.28
[se]	5	73	5.68	82.96
[sɔ]	5	78	5.68	88.64
[so]	4	82	4.55	93.19
[su]	2	84	2.27	95.46
[saU]	2	86	2.27	97.73
[sæ]	1	87	1.14	98.87
[sɔI]	1	88	1.14	100.00
		I/UA		
[sə]	8	8	61.54	61.54
[sɚ]	3	11	23.08	84.62
[sɛ]	1	12	7.69	92.31
[so]	1	13	7.69	100.00
		F/A		
[Is]	10	10	21.28	21.28
[ɛs]	9	19	19.15	40.43
[es]	6	25	12.77	53.10
[æs]	6	31	12.77	65.97
[is]	3	34	6.38	72.35
[ɔs]	3	37	6.38	78.73
[aIs]	3	40	6.38	85.11
[ʌs]	2	42	4.26	89.37
[ɑs]	1	43	2.13	91.50
[os]	1	44	2.13	93.63
[us]	1	45	2.13	95.76
[aUs]	1	46	2.13	97.89
[ɔIs]	1	47	2.13	100.00

TABLE 11a.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[Is]	8	8	66.67	66.67
[əs]	4	12	33.33	100.00

TABLE 11b.--/s/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[st]	19	19	37.25	37.25
[sp]	11	30	21.57	58.82
[str]	7	37	13.73	72.55
[sk]	4	41	7.84	80.39
[sm]	3	44	5.88	86.27
[spr]	2	46	3.92	90.19
[spl]	1	47	1.96	92.15
[skw]	1	48	1.96	94.11
[sn]	1	49	1.96	96.07
[sl]	1	50	1.96	98.03
[sw]	1	51	1.96	100.00
		F/A		
[st]	19	19	46.34	46.34
[ns]	8	27	19.51	65.85
[ts]	4	31	9.76	75.61
[rs]	3	34	7.32	82.93
[ks]	2	36	4.88	87.81
[sk]	1	37	2.44	90.25
[nst]	1	38	2.44	92.69
[ls]	1	39	2.44	95.13
[ps]	1	40	2.44	97.57
[kst]	1	41	2.44	100.00

TABLE 11b.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[ns]	4	4	66.67	66.67
[st]	2	6	33.33	100.00

TABLE 12a.--/z/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[zI]	1	1	25.00	25.00
[zæ]	1	2	25.00	50.00
[zʌ]	1	3	25.00	75.00
[zaI]	1	4	25.00	100.00
		I/UA		
[zə]	3	3	75.00	75.00
[zɪ]	1	4	25.00	100.00
		F/A		
[Iz]	6	6	16.22	16.22
[uz]	6	12	16.22	32.44
[oz]	5	17	13.51	45.95
[iz]	4	21	10.81	56.76
[ʌz]	4	25	10.81	67.57
[aIz]	4	29	10.81	78.38
[ɛz]	3	32	8.11	86.49
[æz]	2	34	5.41	91.90
[ɔz]	2	36	5.41	97.30
[ez]	1	37	2.70	100.00

TABLE 12a.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[aIz]	2	2	50.00	50.00
[Iz]	1	3	25.00	75.00
[ez]	1	4	25.00	100.00

TABLE 12b.--/z/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		F/A		
[lvz]	1	1	100.00	100.00
		F/UA		
[mz]	1	1	100.00	100.00

TABLE 13.--/ʃ/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ʃo]	4	4	22.22	22.22
[ʃʊ]	3	7	16.67	38.89
[ʃi]	2	9	11.11	50.00
[ʃe]	2	11	11.11	61.11
[ʃa]	2	13	11.11	72.22
[ʃɪ]	1	14	5.56	77.78
[ʃɛ]	1	15	5.56	83.34
[ʃæ]	1	16	5.56	88.90
[ʃu]	1	17	5.56	94.46
[ʃaʊ]	1	18	5.56	100.00
		I/UA		
[ʃə]	7	7	100.00	100.00
		F/A		
[ɪʃ]	5	5	41.67	41.67
[eʃ]	3	8	25.00	66.67
[aʃ]	2	10	16.67	83.34
[æʃ]	1	11	8.33	91.67
[ɹʃ]	1	12	8.33	100.00
		F/UA		
[ɪʃ]	3	3	100.00	100.00

TABLE 14.--/ɜ/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/UA		
[ɜU]	1	1	100.00	100.00
		F/A		
[eɜ]	2	2	100.00	100.00

TABLE 15a.--/h/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[hæ]	9	9	19.57	19.57
[hɛ]	8	17	17.39	36.96
[hɪ]	6	23	13.04	50.00
[ho]	4	27	8.70	58.70
[hɝ]	4	31	8.70	67.40
[hi]	3	34	6.52	73.92
[hɑ]	3	37	6.52	80.44
[haɪ]	3	40	6.52	86.96
[hɔ]	2	42	4.35	91.31
[hʌ]	2	44	4.35	95.66
[haʊ]	2	46	4.35	100.00
		I/UA		
[hɪ]	1	1	33.33	33.33
[hɝ]	1	2	33.33	66.66
[haʊ]	1	3	33.33	100.00

TABLE 15b.--/h/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[hj]	1	1	100.00	100.00

TABLE 16a.--/tʃ/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[tʃe]	2	2	22.22	22.22
[tʃi]	1	3	11.11	33.33
[tʃI]	1	4	11.11	44.44
[tʃɛ]	1	5	11.11	55.55
[tʃæ]	1	6	11.11	66.66
[tʃɑ]	1	7	11.11	77.77
[tʃaI]	1	8	11.11	88.88
[tʃɚ]	1	9	11.11	100.00
		I/UA		
[tʃɝ]	3	3	75.00	75.00
[tʃə]	1	4	25.00	100.00
		F/A		
[itʃ]	5	5	33.33	33.33
[Itʃ]	3	8	20.00	53.33
[ʌtʃ]	3	11	20.00	73.33
[ætʃ]	2	13	13.33	86.66
[ɑtʃ]	1	14	6.67	93.33
[ɚtʃ]	1	15	6.67	100.00

TABLE 16b.--/tʃ/-Consonant Combinations by Position and Stress

Context	f	Cf	%	Cum. %
		F/A		
[ntʃ]	3	3	75.00	75.00
[ɹtʃ]	1	4	25.00	100.00

TABLE 17a.--/dʒ/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[dʒɛ]	4	4	26.67	26.67
[dʒɝ]	3	7	20.00	46.67
[dʒɔI]	3	10	20.00	66.67
[dʒɑ]	2	12	13.33	80.00
[dʒʌ]	2	14	13.33	93.33
[dʒɔ]	1	15	6.67	100.00
		I/UA		
[dʒɚ]	2	2	50.00	50.00
[dʒI]	1	3	25.00	75.00
[dʒɛ]	1	4	25.00	100.00
		F/A		
[ɛdʒ]	2	2	40.00	40.00
[Idʒ]	1	3	20.00	60.00
[ɛdʒ]	1	4	20.00	80.00
[ʌdʒ]	1	5	20.00	100.00
		F/UA		
[Idʒ]	1	1	100.00	100.00

TABLE 17b.--/dʒ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		F/A		
[rdʒ]	3	3	60.00	60.00
[ndʒ]	2	5	40.00	100.00

TABLE 18a.--/m/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[mæ]	11	11	17.19	17.19
[mɪ]	9	20	14.06	31.25
[mɛ]	7	27	10.94	42.19
[mʌ]	6	33	9.38	51.57
[mi]	5	38	7.81	59.38
[maɪ]	5	43	7.81	67.19
[me]	4	47	6.25	73.44
[mɑ]	4	51	6.25	79.69
[mu]	4	55	6.25	85.94
[maʊ]	4	59	6.25	92.19
[mo]	3	62	4.69	96.88
[mɔ]	2	64	3.13	100.00
		I/UA		
[mə]	12	12	66.67	66.67
[mɪ]	2	14	11.11	77.78
[mɚ]	2	16	11.11	88.89
[mo]	1	17	5.56	94.45
[mɨ]	1	18	5.56	100.00
		F/A		
[ʌm]	9	9	25.00	25.00
[ɛm]	6	15	16.67	41.67
[im]	3	18	8.33	50.00
[ɪm]	3	21	8.33	58.33
[ɛm]	3	24	8.33	66.66
[æm]	3	27	8.33	74.99
[ɑm]	3	30	8.33	83.32
[um]	2	32	5.56	88.88
[aɪm]	2	34	5.56	94.44
[om]	1	35	2.78	97.22
[ʊm]	1	36	2.78	100.00

TABLE 18a.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[ɜm]	4	4	66.67	66.67
[Im]	2	6	33.33	100.00

TABLE 18b.--/m/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[sm]	3	3	75.00	75.00
[mj]	1	4	25.00	100.00
		F/A		
[rm]	5	5	71.43	71.43
[mp]	1	6	14.29	85.72
[mpt]	1	7	14.29	100.00
		F/UA		
[mz]	1	1	100.00	100.00

TABLE 19a.--/n/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[no]	6	6	15.38	15.38
[ne]	5	11	12.82	28.20
[nʌ]	5	16	12.82	41.02
[naI]	5	21	12.82	53.84
[nɛ]	4	25	10.26	64.10
[ni]	3	28	7.69	71.79
[næ]	3	31	7.69	79.48
[nI]	2	33	5.13	84.61
[nɑ]	2	35	5.13	89.74
[nɔ]	2	37	5.13	94.87
[nu]	1	38	2.56	97.43
[naU]	1	39	2.56	100.00
		I/UA		
[nI]	4	4	57.14	57.14
[n̩]	2	6	28.57	85.71
[nɚ]	1	7	14.29	100.00
		F/A		
[ɛn]	19	10	17.92	17.92
[In]	18	37	16.98	34.90
[ʌn]	13	50	12.26	47.16
[æn]	11	61	10.38	57.54
[en]	9	70	8.49	66.03
[in]	8	78	7.55	73.88
[on]	5	83	4.72	78.30
[aIn]	5	88	4.72	83.02
[ɑn]	4	92	3.77	86.79
[un]	4	96	3.77	90.56
[ɝn]	4	100	3.77	94.33
[aUn]	4	104	3.77	98.10
[ɔn]	1	105	0.94	99.04
[ɔIn]	1	106	0.94	100.00

TABLE 19a.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[ən]	40	40	76.92	76.92
[ɪn]	9	49	17.31	94.23
[ɚn]	2	51	3.85	98.08
[ʌn]	1	52	1.92	100.00

TABLE 19b.--/n/-Consonant Combinations by Syllabic Positionand Stress

Context	f	Cf	%	Cum. %
		I/A		
[nj]	4	4	80.00	80.00
[sn]	1	5	20.00	100.00
		I/UA		
[nj]	1	1	100.00	100.00
		F/A		
[nd]	22	22	37.93	37.93
[nt]	16	38	27.59	65.52
[ns]	8	46	13.79	79.31
[nk]	4	50	6.90	86.21
[ntʃ]	3	53	5.17	91.38
[ndʒ]	2	55	3.45	94.83
[rn]	2	57	3.45	98.28
[nst]	1	58	1.72	100.00

TABLE 19b.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[nt]	6	6	46.15	46.15
[ns]	4	10	30.77	76.92
[nd]	3	13	23.08	100.00

TABLE 20.--/ŋ/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		F/A		
[Iŋ]	10	10	50.00	50.00
[ɔŋ]	6	16	30.00	80.00
[ʌŋ]	3	19	15.00	95.00
[æŋ]	1	20	5.00	100.00
		F/UA		
[Iŋ]	15	15	100.00	100.00

TABLE 21a.--/l/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[lɛ]	9	9	17.65	17.65
[lɔ]	7	16	13.73	31.38
[le]	6	22	11.76	43.14
[lɪ]	5	27	9.80	52.94
[laɪ]	5	32	9.80	62.74
[li]	4	36	7.84	70.58
[lo]	4	40	7.84	78.42
[læ]	3	43	5.88	84.30
[lɑ]	2	45	3.92	88.22
[lʌ]	2	47	3.92	92.14
[lʊ]	1	48	1.96	94.10
[lu]	1	49	1.96	96.06
[lɚ]	1	50	1.96	98.02
[laʊ]	1	51	1.96	100.00
		I/UA		
[lɪ]	10	10	71.43	71.43
[lə]	3	13	21.43	92.86
[laɪ]	1	14	7.14	100.00
		F/A		
[ɪl]	12	12	19.67	19.67
[ɔl]	10	22	16.39	36.06
[ol]	8	30	13.11	49.17
[ɛl]	6	36	9.84	59.01
[ɑl]	4	40	6.56	65.57
[ul]	4	44	6.56	72.13
[el]	3	47	4.92	77.05
[æl]	3	50	4.92	81.97
[aɪl]	3	53	4.92	86.89
[il]	2	55	3.28	90.17
[ʊl]	2	57	3.28	93.45
[ɔɪl]	2	59	3.28	96.73
[ʌl]	1	60	1.64	98.37
[ɚl]	1	61	1.64	100.00

TABLE 21a.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[əl]	9	9	81.82	81.82
[ɔl]	2	11	18.18	100.00

TABLE 21b.--/l/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[kl]	10	10	43.48	43.48
[bl]	4	14	17.39	60.87
[fl]	4	18	17.39	78.26
[gl]	2	20	8.70	86.96
[pl]	1	21	4.35	91.31
[sl]	1	22	4.35	95 66
[spl]	1	23	4.35	100.00
		I/UA		
[gl]	2	2	66.67	66.67
[bl]	1	3	33.33	100.00
		F/A		
[ld]	13	13	46.43	46.43
[lf]	5	18	17.86	64.29
[lt]	4	22	14.29	78.58
[lp]	1	23	3.57	82.15
[lk]	1	24	3.57	85.72
[lv]	1	25	3.57	89.29
[lvz]	1	26	3.57	92.86
[ls]	1	27	3.57	96.43
[lθ]	1	28	3.57	100.00

TABLE 22a.--/w/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[wɪ]	9	9	19.15	19.15
[we]	6	15	12.77	31.92
[wɛ]	5	20	10.64	42.56
[wɑ]	5	25	10.64	53.20
[wɔ]	5	30	10.64	63.84
[wɝ]	5	35	10.64	74.48
[waɪ]	4	39	8.51	82.99
[wʊ]	3	42	6.38	89.37
[wi]	2	44	4.26	93.63
[wʌ]	2	46	4.26	97.89
[wo]	1	47	2.13	100.00
		I/UA		
[wɪ]	3	3	60.00	60.00
[wɚ]	2	5	40.00	100.00

TABLE 22b.--/w/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[kw]	6	6	54.55	54.55
[tw]	3	9	27.27	81.82
[sw]	1	10	9.09	90.91
[skw]	1	11	9.09	100.00

TABLE 23.--/hw/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[hwɛ]	3	3	37.50	37.50
[hwaI]	3	6	37.50	75.00
[hwI]	1	7	12.50	87.50
[hwɑ]	1	8	12.50	100.00
		I/UA		
[hwɔ]	1	1	100.00	100.00

TABLE 24a.--/j/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ju]	6	6	37.50	37.50
[jɛ]	3	9	18.75	56.25
[jɑ]	2	11	12.50	68.75
[jU]	2	13	12.50	81.25
[ji]	1	14	6.25	87.50
[jɔ]	1	15	6.25	93.75
[jʌ]	1	16	6.25	100.00
		I/UA		
[jU]	4	4	57.14	57.14
[jə]	2	6	28.57	85.71
[jɚ]	1	7	14.29	100.00

TABLE 24b.--/j/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[nj]	4	4	26.67	26.67
[dj]	3	7	20.00	46.67
[fj]	3	10	20.00	66.67
[bj]	2	12	13.33	80.00
[vj]	1	13	6.67	86.67
[hj]	1	14	6.67	93.34
[mj]	1	15	6.67	100.00
		I/UA		
[bj]	1	1	50.00	50.00
[nj]	1	2	50.00	100.00

TABLE 25a.--/r/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[rɛ]	7	7	16.67	16.67
[ri]	6	13	14.29	30.96
[re]	5	18	11.90	42.86
[raI]	5	23	11.90	54.76
[rI]	4	27	9.52	64.28
[ro]	4	31	9.52	73.80
[ru]	3	34	7.14	80.94
[ræ]	2	36	4.76	85.70
[rʌ]	2	38	4.76	90.46
[raU]	2	40	4.76	95.22
[rɑ]	1	41	2.38	97.60
[rɔ]	1	42	2.38	100.00

TABLE 25a.--Continued

Context	f	Cf	%	Cum. %
		I/UA		
[rI]	16	16	84.21	84.21
[rə]	2	18	10.53	94.74
[ro]	1	19	5.26	100.00
		F/A		
[ɛr]	24	24	28.24	28.24
[Ir]	13	37	15.29	43.53
[ɔr]	13	50	15.29	58.82
[ɑr]	11	61	12.94	71.76
[or]	7	68	8.24	80.00
[Ur]	6	74	7.06	87.06
[ær]	5	79	5.88	92.94
[aIr]	4	83	4.71	97.65
[aUr]	2	85	2.35	100.00

TABLE 25b.--/r/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[pr]	13	13	16.67	16.67
[tr]	12	25	15.38	32.05
[gr]	11	36	14.10	46.15
[br]	10	46	12.82	58.97
[fr]	9	55	11.54	70.51
[dr]	7	62	8.97	79.48
[str]	7	69	8.97	88.45
[kr]	5	74	6.41	94.86
[θr]	2	76	2.56	97.42
[spr]	2	78	2.56	100.00

TABLE 25b.--Continued

Context	f	Cf	%	Cum. %
		I/UA		
[pr]	3	3	37.50	37.50
[tr]	3	6	37.50	75.00
[dr]	2	8	25.00	100.00
		F/A		
[rt]	10	10	27.03	27.03
[rd]	8	18	21.62	48.65
[rm]	5	23	13.51	62.16
[rk]	3	26	8.11	70.27
[rs]	3	29	8.11	78.38
[rdʒ]	3	32	8.11	86.49
[rθ]	2	34	5.41	91.90
[rn]	2	36	5.41	97.31
[rtʃ]	1	37	2.70	100.00

Inspection of the foregoing tables for consonant-vowel combinations reveals that, except in the Final/Unaccented category, for most consonants a relatively small number of different contexts account for a relatively large number of the total number of contexts in a particular position/stress category. The type-token concept as explained by Carroll (1964) in relation to vocabulary studies is useful here. As Carroll uses the two terms, the number of types refers to the number of different words, and the number of tokens refers to the total number of words. Adapted to the phenomenon of phonetic context, then, the number of types refers to the

number of different contexts and the number of tokens refers to the total number of contexts occurring for a particular phoneme in a particular position/stress category.

Of the 24 consonants which occur in the initial position of accented syllables, 15 have one-third or less of their types accounting for 50% of the tokens. For 11 of the 23 consonants which occur in the initial position of unaccented syllables, one-third or less of the types account for 50% of the tokens. Ten of the 21 consonants which occur in the final position of accented syllables have one-third or less of their types accounting for 50% of their tokens. Of the 17 consonants which occur in the final position of unaccented syllables, only two have 33% or less of the types accounting for 50% of the tokens. This may be accounted for by the relatively small number of types occurring for each consonant in the Final/Unaccented category.

The same relationship exists for the blend-contexts of consonants in the Initial/Accented and Final/Accented categories. Of the 18 consonants which occur as blends in the initial position of accented syllables, five have frequency distributions such that one-third or less of the types account for 50% of the tokens. Eight of the 15 consonants occurring in the final position of accented syllables have one-third or less of the types accounting for 50% of the tokens. Of the seven consonants occurring in the final position of unaccented syllables, only /t/ has one-third

of its types accounting for 50% of its tokens. The relationship does not hold for any of the ten consonants occurring in the initial position of unaccented syllables. The lack of the relationship in the two unaccented categories is again explained by the relatively low number of types which occur for each consonant in these categories.

TABLE 26.--/i/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[i]	2	2	28.57	28.57
[it]	1	3	14.29	42.86
[iv]	1	4	14.29	57.15
[iz]	1	5	14.29	71.44
[itʃ]	1	6	14.29	85.73
[ist]	1	7	14.29	100.00
		M/A		
[si]	6	6	12.00	12.00
[li]	5	11	10.00	22.00
[mi]	4	15	8.00	30.00
[di]	3	18	6.00	36.00
[ri]	3	21	6.00	42.00
[pi]	2	23	4.00	46.00
[ti]	2	25	4.00	50.00
[hi]	2	27	4.00	54.00
[ri]	2	29	4.00	58.00
[pli]	2	31	4.00	62.00
[spi]	2	33	4.00	66.00
[stri]	2	35	4.00	70.00
[bi]	1	36	2.00	72.00
[ki]	1	37	2.00	74.00
[ði]	1	38	2.00	76.00
[ʃi]	1	39	2.00	78.00

TABLE 26.--Continued

Context	f	Cf	%	Cum. %
[tʃi]	1	40	2.00	80.00
[ni]	1	41	2.00	82.00
[wi]	1	42	2.00	84.00
[twi]	1	43	2.00	86.00
[dri]	1	44	2.00	88.00
[kli]	1	45	2.00	90.00
[kri]	1	46	2.00	92.00
[kwi]	1	47	2.00	94.00
[gri]	1	48	2.00	96.00
[sli]	1	49	2.00	98.00
[swi]	1	50	2.00	100.00
		F/A		
[ri]	4	4	16.67	16.67
[si]	3	7	12.50	29.17
[bi]	2	9	8.33	37.50
[öi]	2	11	8.33	45.83
[ni]	2	13	8.33	54.16
[gri]	2	15	8.33	62.49
[pi]	1	16	4.17	66.66
[di]	1	17	4.17	70.83
[ʃi]	1	18	4.17	75.00
[hi]	1	19	4.17	79.17
[mi]	1	20	4.17	83.34
[wi]	1	21	4.17	87.51
[tri]	1	22	4.17	91.68
[fri]	1	23	4.17	95.85
[θri]	1	24	4.17	100.00

TABLE 27.--/I/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[In]	6	6	33.33	33.33
[Iz]	2	8	11.11	44.44
[Iŋ]	2	10	11.11	55.55
[Its]	2	12	11.11	66.66
[It]	1	13	5.56	72.22
[Ir]	1	14	5.56	77.78
[I/]	1	15	5.56	83.34
[Il]	1	16	5.56	88.90
[Ir]	1	17	5.56	94.46
[Int/]	1	18	5.56	100.00
		I/UA		
[I]	32	32	43.84	43.84
[Iŋ]	9	41	12.33	56.17
[In]	8	49	10.96	67.13
[Ik]	6	55	8.22	75.35
[It]	4	59	5.48	80.83
[Idʒ]	4	63	5.48	86.31
[Is]	3	66	4.11	90.42
[I/]	2	68	2.74	93.16
[Ist]	2	70	2.75	95.90
[Ig]	1	71	1.37	97.27
[Iz]	1	72	1.37	98.64
[Im]	1	73	1.37	100.00
		M/A		
[sI]	12	12	10.81	10.81
[mI]	9	21	8.11	18.92
[bI]	8	29	7.21	26.13
[fI]	8	37	7.21	33.34
[wI]	8	45	7.21	40.55
[dI]	7	52	6.31	46.86
[hI]	6	58	5.41	52.27

TABLE 27.--Continued

Context	f	Cf	%	Cum. %
[pɪ]	5	63	4.50	56.77
[tɪ]	5	68	4.50	61.27
[lɪ]	5	73	4.50	65.77
[kɪ]	4	77	3.60	69.37
[rɪ]	4	81	3.60	72.97
[gɪ]	3	84	2.70	75.67
[θɪ]	3	87	2.70	78.37
[brɪ]	3	90	2.70	81.07
[vɪ]	2	92	1.80	82.87
[prɪ]	2	94	1.80	84.67
[spɪ]	2	96	1.80	86.47
[stɪ]	2	98	1.80	88.27
[ðɪ]	1	99	0.90	89.17
[zɪ]	1	100	0.90	90.07
[ʃɪ]	1	101	0.90	90.97
[tʃɪ]	1	102	0.90	91.87
[nɪ]	1	103	0.90	92.77
[hwɪ]	1	104	0.90	93.67
[jɪ]	1	105	0.90	94.57
[trɪ]	1	106	0.90	95.47
[drɪ]	1	107	0.90	96.37
[klɪ]	1	108	0.90	97.27
[kwɪ]	1	109	0.90	98.17
[skɪ]	1	110	0.90	99.07
[sprɪ]	1	111	0.90	100.00
		M/UA		
[tɪ]	5	5	23.81	23.81
[θɪ]	3	8	14.29	38.10
[nɪ]	3	11	14.29	52.39
[wɪ]	3	14	14.29	66.68
[kɪ]	1	15	4.76	71.44
[vɪ]	1	16	4.76	76.20
[zɪ]	1	17	4.76	80.96
[hɪ]	1	18	4.76	85.72
[dʒɪ]	1	19	4.76	90.48
[lɪ]	1	20	4.76	95.24
[glɪ]	1	21	4.76	100.00

TABLE 27.--Continued

Context	f	Cf	%	Cum. %
		F/UA		
[rI]	16	16	26.23	26.23
[bI]	10	26	16.39	42.62
[dI]	10	36	16.39	59.01
[lI]	9	45	14.75	73.76
[tI]	8	53	13.11	86.87
[trI]	3	56	4.92	91.79
[mI]	2	58	3.28	95.00
[nI]	1	59	1.64	96.71
[prI]	1	60	1.64	98.35
[blI]	1	61	1.64	100.00

TABLE 28.--/e/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[e]	1	1	33.33	33.33
[et]	1	2	33.33	66.66
[edʒ]	1	3	33.33	100.00
		M/A		
[te]	5	5	8.47	8.47
[re]	5	10	8.47	16.94
[pe]	4	14	6.78	23.72
[ge]	4	18	6.78	30.50
[se]	4	22	6.78	37.28
[we]	4	26	6.78	44.06
[ke]	3	29	5.08	49.14
[me]	3	32	5.08	54.22
[le]	3	35	5.08	59.30
[de]	2	37	3.39	62.69
[fe]	2	39	3.39	66.08
[ʃe]	2	41	3.39	69.47
[ple]	2	43	3.39	72.86
[tre]	2	45	3.39	76.25
[ste]	2	47	3.39	79.64
[stre]	2	49	3.39	83.03
[be]	1	50	1.69	84.72
[tʃe]	1	51	1.69	86.41
[ne]	1	52	1.69	88.10
[bre]	1	53	1.69	89.79
[kle]	1	54	1.69	91.48
[gre]	1	55	1.69	93.17
[fre]	1	56	1.69	94.86
[spe]	1	57	1.69	96.55
[ske]	1	58	1.69	98.24
[sple]	1	59	1.69	100.00

TABLE 28.--Continued

Context	f	Cf	%	Cum. %
		F/A		
[ne]	4	4	16.00	16.00
[le]	3	7	12.00	18.00
[pe]	2	9	8.00	36.00
[be]	2	11	8.00	44.00
[de]	2	13	8.00	52.00
[fe]	2	15	8.00	60.00
[we]	2	17	8.00	68.00
[ste]	2	19	8.00	76.00
[te]	1	20	4.00	80.00
[ðe]	1	21	4.00	84.00
[se]	1	22	4.00	88.00
[me]	1	23	4.00	92.00
[ple]	1	24	4.00	96.00
[gre]	1	25	4.00	100.00

TABLE 29.--/ɛ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ɛv]	5	5	31.25	31.25
[ɛn]	4	9	25.00	65.25
[ɛ]	1	10	6.25	62.50
[ɛd]	1	11	6.25	68.75
[ɛg]	1	12	6.25	75.00
[ɛdʒ]	1	13	6.25	81.25
[ɛr]	1	14	6.25	87.50
[ɛnd]	1	15	6.25	93.75
[ɛlz]	1	16	6.25	100.00
		M/A		
[sɛ]	22	22	16.42	16.42
[mɛ]	11	33	8.21	24.63
[hɛ]	8	41	5.97	30.60
[lɛ]	8	49	5.97	36.57
[rɛ]	7	56	5.22	41.79
[gɛ]	6	62	4.48	46.27
[bɛ]	5	67	3.73	50.00
[fɛ]	5	72	3.73	53.73
[ðɛ]	5	77	3.73	57.46
[dʒɛ]	5	82	3.73	61.19
[wɛ]	5	87	3.73	64.92
[tɛ]	4	91	2.99	67.91
[nɛ]	4	95	2.99	70.90
[spɛ]	4	99	2.99	73.89
[dɛ]	3	102	2.24	76.13
[hwɛ]	3	105	2.24	78.37
[jɛ]	3	108	2.24	80.61
[prɛ]	3	111	2.24	82.85
[frɛ]	3	114	2.24	85.09

TABLE 29.--Continued

Context	f	Cf	%	Cum. %
[pɛ]	2	116	1.49	86.58
[kɛ]	2	118	1.49	88.07
[vɛ]	2	120	1.49	89.56
[tʃɛ]	2	122	1.49	91.05
[twɛ]	2	124	1.49	92.54
[stɛ]	2	126	1.49	94.03
[ʃɛ]	1	127	0.75	94.78
[plɛ]	1	128	0.75	95.53
[drɛ]	1	129	0.75	96.28
[klɛ]	1	130	0.75	97.03
[kwɛ]	1	131	0.75	97.78
[sprɛ]	1	132	0.75	98.53
[strɛ]	1	133	0.75	99.28
[skwɛ]	1	134	0.75	100.00
		M/UA		
[ðɛ]	1	1	50.00	50.00
[sɛ]	1	2	50.00	100.00

TABLE 30.--/æ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[æn]	3	3	27.27	27.27
[æt]	2	5	18.18	45.45
[æd]	1	6	9.09	54.54
[æk]	1	7	9.09	63.63
[æf]	1	8	9.09	72.72
[æm]	1	9	9.09	81.81
[ækt]	1	10	9.09	90.90
[æsk]	1	11	9.09	100.00
		I/UA		
[æk]	1	1	50.00	50.00
[æf]	1	2	50.00	100.00
		M/A		
[hæ]	10	10	13.33	13.33
[kæ]	8	18	10.67	24.00
[mæ]	7	25	9.33	33.33
[pæ]	5	30	6.67	40.00
[bæ]	5	35	6.67	46.67
[fæ]	4	39	5.33	52.00
[væ]	3	42	4.00	56.00
[ðæ]	3	45	4.00	60.00
[næ]	3	48	4.00	64.00
[læ]	3	51	4.00	68.00
[gæ]	2	53	2.67	70.67
[ræ]	2	55	2.67	73.34
[plæ]	2	57	2.67	76.01
[glæ]	2	59	2.67	78.68
[græ]	2	61	2.67	81.35
[stæ]	2	63	2.67	84.02

TABLE 30.--Continued

Context	f	Cf	%	Cum. %
[dæ]	1	64	1.33	85.35
[θæ]	1	65	1.33	86.68
[æ]	1	66	1.33	88.01
[zæ]	1	67	1.33	89.34
[ʃæ]	1	68	1.33	90.67
[tʃæ]	1	69	1.33	92.00
[præ]	1	70	1.33	93.33
[blæ]	1	71	1.33	94.66
[bræ]	1	72	1.33	95.99
[træ]	1	73	1.33	97.32
[klæ]	1	74	1.33	98.65
[fræ]	1	75	1.33	100.00

TABLE 31.--/ɑ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ɑr]	4	4	44.44	44.44
[ɑ]	1	5	11.11	55.55
[ɑn]	1	6	11.11	66.66
[ɑrt]	1	7	11.11	77.77
[ɑrm]	1	8	11.11	88.88
[ɑv]	1	9	11.11	100.00
		M/A		
[pɑ]	5	5	8.33	8.33
[gɑ]	5	10	8.33	16.66
[fɑ]	5	15	8.33	24.99
[wɑ]	5	20	8.33	33.32
[kɑ]	4	24	6.67	39.99
[mɑ]	4	28	6.67	46.66
[prɑ]	4	32	6.67	53.33
[stɑ]	4	36	6.67	60.00
[dɑ]	3	39	5.00	65.00
[hɑ]	3	42	5.00	70.00
[bɑ]	2	44	3.33	73.33
[ʃɑ]	2	46	3.33	76.66
[dʒɑ]	2	48	3.33	79.99
[nɑ]	2	50	3.33	83.32
[lɑ]	2	52	3.33	86.65
[jɑ]	2	54	3.33	89.98
[tɑ]	1	55	1.67	91.65
[tʃɑ]	1	56	1.67	93.32
[hwɑ]	1	57	1.67	94.99
[rɑ]	1	58	1.67	96.66
[drɑ]	1	59	1.67	98.33
[spɑ]	1	60	1.67	100.00

TABLE 31.--Continued

Context	f	Cf	%	Cum. %
		M/UA		
[hwɑ]	1	1	100.00	100.00
		F/A		
[kɑ]	1	1	50.00	50.00
[fɑ]	1	2	50.00	100.00

TABLE 32.--/ɔ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ɔf]	4	4	36.36	36.36
[ɔl]	4	8	36.36	72.72
[ɔr]	2	10	18.18	90.90
[ɔ]	1	11	9.09	100.00
		I/UA		
[ɔl]	2	2	100.00	100.00
		M/A		
[fɔ]	8	8	15.09	15.09
[kɔ]	7	15	13.21	28.30
[lɔ]	6	21	11.32	39.62
[wɔ]	4	25	7.55	47.17
[sɔ]	3	28	5.66	52.83

TABLE 32.--Continued

Context	f	Cf	%	Cum. %
[mɔ]	3	31	5.66	58.49
[tɔ]	2	33	3.77	62.26
[hɔ]	2	35	3.77	66.03
[nɔ]	2	37	3.77	69.80
[krɔ]	2	39	3.77	73.57
[pɔ]	1	40	1.89	75.46
[bɔ]	1	41	1.89	77.35
[dɔ]	1	42	1.89	79.24
[gɔ]	1	43	1.89	81.83
[θɔ]	1	44	1.89	83.02
[ʃɔ]	1	45	1.89	84.91
[dʒɔ]	1	46	1.89	86.80
[jɔ]	1	47	1.89	88.69
[rɔ]	1	48	1.89	90.58
[brɔ]	1	49	1.89	92.47
[kwɔ]	1	50	1.89	94.36
[stɔ]	1	.51	1.89	96.25
[smɔ]	1	52	1.89	98.14
[strɔ]	1	53	1.89	100.00
		F/A		
[sɔ]	2	2	33.33	33.33
[dɔ]	1	3	16.67	50.00
[lɔ]	1	4	16.67	66.67
[wɔ]	1	5	16.67	83.34
[drɔ]	1	6	16.67	100.00

TABLE 33.--/o/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[o]	4	4	57.14	57.14
[on]	2	6	28.57	85.71
[old]	1	7	14.29	100.00
		I/UA		
[o]	6	6	100.00	100.00
		M/A		
[ko]	5	5	9.62	9.62
[ho]	5	10	9.62	19.24
[po]	4	14	7.69	26.93
[ro]	4	18	7.69	34.62
[bo]	3	21	5.77	40.39
[fo]	3	24	5.77	46.16
[so]	3	27	5.77	51.93
[no]	3	30	5.77	57.70
[to]	2	32	3.85	61.55
[do]	2	34	3.85	65.40
[go]	2	36	3.85	69.25
[ʃo]	2	38	3.85	73.10
[klo]	2	40	3.85	76.95
[sto]	2	42	3.85	80.80
[vo]	1	43	1.92	82.72
[ðo]	1	44	1.92	84.64
[mo]	1	45	1.92	86.56
[lo]	1	46	1.92	88.48
[we]	1	47	1.92	90.40
[bro]	1	48	1.92	92.32
[tro]	1	49	1.92	94.24
[flo]	1	50	1.92	96.16
[spo]	1	51	1.92	98.08
[smo]	1	52	1.92	100.00

TABLE 33.--Continued

Context	f	Cf	%	Cum. %
		M/UA		
[fo]	1	1	33.33	33.33
[mo]	1	2	33.33	66.66
[ro]	1	3	33.33	100.00
		F/A		
[go]	3	3	16.67	16.67
[no]	3	6	16.67	33.34
[lo]	3	9	16.67	50.01
[ðo]	2	11	11.11	61.12
[so]	1	12	5.56	66.68
[ʃo]	1	13	5.56	72.24
[mo]	1	14	5.56	77.80
[gro]	1	15	5.56	83.36
[flo]	1	16	5.56	88.92
[sto]	1	17	5.56	94.48
[sno]	1	18	5.56	100.00
		F/UA		
[do]	1	1	33.33	33.33
[go]	1	2	33.33	66.66
[so]	1	3	33.33	100.00

TABLE 34.--/ʊ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		M/A		
[pʊ]	3	3	13.04	13.04
[kʊ]	3	6	13.04	26.08
[ʃʊ]	3	9	13.04	39.12
[wʊ]	3	12	13.04	56.16
[jʊ]	3	15	13.04	65.20
[rʊ]	2	17	8.70	73.90
[bʊ]	1	18	4.35	78.25
[tʊ]	1	19	4.35	82.60
[gʊ]	1	20	4.35	86.95
[lʊ]	1	21	4.35	91.30
[kjʊ]	1	22	4.35	95.65
[stʊ]	1	23	4.35	100.00
		M/UA		
[sʊ]	1	1	50.00	50.00
[jʊ]	1	2	50.00	100.00

TABLE 35.--/u/-Vowel Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		M/A		
[mu]	4	4	13.79	13.79
[ju]	3	7	10.34	24.13
[ru]	3	10	10.34	34.47
[fu]	2	12	6.90	41.37
[su]	2	14	6.90	48.27
[hu]	2	16	6.90	55.17
[nju]	2	18	6.90	62.07
[ku]	1	19	3.45	65.52
[nu]	1	20	3.45	68.97
[lu]	1	21	3.45	72.42
[pru]	1	22	3.45	75.87
[tru]	1	23	3.45	79.32
[dju]	1	24	3.45	82.77
[klu]	1	25	3.45	86.22
[gru]	1	26	3.45	89.67
[fju]	1	27	3.45	93.12
[fru]	1	28	3.45	96.57
[sku]	1	29	3.45	100.00
		M/UA		
[bju]	1	1	100.00	100.00
		F/A		
[tu]	3	3	13.04	13.04
[ju]	2	5	8.70	21.74
[bju]	2	7	8.70	30.44
[dju]	2	9	8.70	39.14
[fju]	2	11	8.70	47.84
[nju]	2	13	8.70	56.54
[du]	1	14	4.35	60.89

TABLE 35.--Continued

Context	f	Cf	%	Cum. %
[ʃu]	1	15	4.35	65.24
[hu]	1	16	4.35	69.59
[blu]	1	17	4.35	73.94
[tru]	1	18	4.35	78.29
[gru]	1	19	4.35	82.64
[vju]	1	20	4.35	86.99
[θru]	1	21	4.35	91.34
[hju]	1	22	4.35	95.69
[mju]	1	23	4.35	100.00
		F/UA		
[tu]	1	1	50.00	50.00
[nju]	1	2	50.00	100.00

TABLE 36.--/ɝ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ɝ]	1	1	50.00	50.00
[ɝθ]	1	2	50.00	100.00
		M/A		
[wɝ]	4	4	25.00	25.00
[bɝ]	2	6	12.50	37.50
[tɝ]	2	8	12.50	50.00
[hɝ]	2	10	12.50	62.50
[fɝ]	1	11	6.25	68.75
[gɝ]	1	12	6.25	75.00
[sɝ]	1	13	6.25	81.25
[θɝ]	1	14	6.25	87.50
[lɝ]	1	15	6.25	93.75
[tʃɝ]	1	17	6.25	100.00
		F/A		
[sɝ]	4	4	30.77	30.77
[dʒɝ]	3	7	23.08	53.85
[pɝ]	2	9	15.38	69.23
[fɝ]	1	10	7.69	76.92
[θɝ]	1	11	7.69	84.61
[hɝ]	1	12	7.69	92.30
[wɝ]	1	13	7.69	100.00

TABLE 37.--/ɚ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		M/UA		
[wɚ]	2	2	33.33	33.33
[dɚ]	1	3	16.67	50.00
[kɚ]	1	4	16.67	66.67
[fɚ]	1	5	16.67	83.34
[vɚ]	1	6	16.67	100.00
		F/UA		
[tɚ]	16	16	17.78	17.78
[ðɚ]	13	29	14.44	32.22
[vɚ]	10	39	11.11	43.33
[dɚ]	8	47	8.89	52.22
[pɚ]	5	52	5.56	57.78
[bɚ]	5	57	5.56	63.34
[fɚ]	5	62	5.56	68.90
[ɚ]	4	66	4.44	73.34
[nɚ]	4	70	4.44	77.78
[tʃɚ]	4	74	4.44	82.22
[gɚ]	3	77	3.33	85.55
[sɚ]	3	80	3.33	88.88
[mɚ]	3	83	3.33	92.21
[dʒɚ]	2	85	2.22	94.43
[ʒɚ]	2	87	2.22	96.65
[θɚ]	1	88	1.11	97.76
[lɚ]	1	89	1.11	98.87
[hɚ]	1	90	1.11	100.00

TABLE 38.--/ə/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/UA		
[ə]	43	43	59.72	59.72
[ən]	15	58	20.83	80.55
[əd]	4	62	5.56	86.11
[əl]	4	66	5.56	91.67
[əb]	2	68	2.78	94.45
[əp]	1	69	1.39	95.84
[əs]	1	70	1.39	97.23
[ənd]	1	71	1.39	98.62
[əns]	1	72	1.39	100.00
		M/UA		
[mə]	9	9	17.65	17.65
[kə]	7	16	13.73	31.38
[ʃə]	7	23	13.73	45.11
[tə]	4	27	7.84	52.95
[də]	3	30	5.88	58.83
[lə]	3	33	5.88	64.71
[jə]	3	36	5.88	70.59
[pə]	2	38	3.92	74.51
[fə]	2	40	3.92	78.43
[sə]	2	42	3.92	82.35
[rə]	2	44	3.92	86.27
[drə]	2	46	3.92	90.19
[bə]	1	47	1.96	92.15
[və]	1	48	1.96	94.11
[ðə]	1	49	1.96	96.07
[tʃə]	1	50	1.96	98.03
[glə]	1	51	1.96	100.00
		F/UA		
[sə]	5	5	18.52	18.52
[bə]	4	9	14.81	33.33

TABLE 38.--Continued

Context	f	Cf	%	Cum. %
[tə]	4	13	14.81	48.14
[də]	3	16	11.11	59.25
[pə]	2	18	7.41	66.66
[kə]	2	20	7.41	74.07
[mə]	2	22	7.41	81.48
[prə]	2	24	7.41	88.89
[ʃə]	1	25	3.70	92.59
[tʃə]	1	26	3.70	96.29
[rə]	1	27	3.70	100.00

TABLE 39.--/ʌ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
I/A				
[ʌp]	1	1	20.00	20.00
[ʌð]	1	2	20.00	40.00
[ʌs]	1	3	20.00	60.00
[ʌn]	1	4	20.00	80.00
[ʌŋ]	1	5	20.00	100.00
I/UA				
[ʌn]	1	1	100.00	100.00
M/A				
[sʌ]	11	11	17.19	17.19
[kʌ]	9	20	14.06	31.25
[mʌ]	6	26	9.38	40.63
[nʌ]	5	31	7.81	48.44
[dʌ]	4	35	6.25	54.69

TABLE 39.--Continued

Context	f	Cf	%	Cum. %
[wʌ]	4	39	6.25	60.94
[bʌ]	3	42	4.69	65.63
[hʌ]	2	44	3.13	68.76
[dʒʌ]	2	46	3.13	71.89
[lʌ]	2	48	3.13	75.02
[rʌ]	2	50	3.13	78.15
[trʌ]	2	52	3.13	81.28
[frʌ]	2	54	3.13	84.41
[pʌ]	1	55	1.56	85.97
[tʌ]	1	56	1.56	87.53
[gʌ]	1	57	1.56	89.09
[ðʌ]	1	58	1.56	90.65
[zʌ]	1	59	1.56	92.21
[jʌ]	1	60	1.56	93.77
[blʌ]	1	61	1.56	95.33
[klʌ]	1	62	1.56	96.89
[stʌ]	1	63	1.56	98.45
[skʌ]	1	64	1.56	100.00
F/A				
[brʌ]	1	1	100.00	100.00

TABLE 40.--/aɪ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[aɪ]	4	4	50.00	50.00
[aɪd]	1	5	12.50	62.50
[aɪs]	1	6	12.50	75.00
[aɪm]	1	7	12.50	87.50
[aɪl]	1	8	12.50	100.00
		I/UA		
[aɪ]	1	1	100.00	100.00
		M/A		
[saɪ]	7	7	12.96	12.96
[faɪ]	5	12	9.26	22.22
[raɪ]	5	17	9.26	31.48
[maɪ]	4	21	7.41	38.89
[naɪ]	4	25	7.41	46.30
[laɪ]	4	29	7.41	53.71
[waɪ]	4	33	7.41	61.12
[taɪ]	3	36	5.56	66.68
[vaɪ]	2	38	3.70	70.38
[haɪ]	2	40	3.70	74.08
[hwaɪ]	2	42	3.70	77.78
[praɪ]	2	44	3.70	81.48
[kwaɪ]	2	46	3.70	85.18
[kaɪ]	1	47	1.85	87.03
[gaɪ]	1	48	1.85	88.88
[zaɪ]	1	49	1.85	90.73
[tʃaɪ]	1	50	1.85	92.58
[baɪ]	1	51	1.85	94.43
[traɪ]	1	52	1.85	96.28
[draɪ]	1	53	1.85	98.13
[smaɪ]	1	54	1.85	100.00

TABLE 40.--Continued

Context	f	Cf	%	Cum. %
		M/UA		
[taɪ]	1	1	33.33	33.33
[saɪ]	1	2	33.33	66.66
[laɪ]	1	3	33.33	100.00
		F/A		
[baɪ]	2	2	10.53	10.53
[saɪ]	2	4	10.53	21.06
[plaɪ]	2	6	10.53	31.59
[taɪ]	1	7	5.26	36.85
[daɪ]	1	8	5.26	42.11
[faɪ]	1	9	5.26	47.37
[haɪ]	1	10	5.26	52.63
[maɪ]	1	11	5.26	57.89
[laɪ]	1	12	5.26	63.15
[hwaɪ]	1	13	5.26	68.41
[traɪ]	1	14	5.26	73.67
[draɪ]	1	15	5.26	78.93
[kraɪ]	1	16	5.26	84.19
[flaɪ]	1	17	5.26	89.45
[naɪ]	1	18	5.26	94.71
[skaɪ]	1	19	5.26	100.00
		F/UA		
[maɪ]	1	1	100.00	100.00

TABLE 41.--/aʊ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[aʊt]	3	3	60.00	60.00
[aʊr]	2	5	40.00	100.00
		M/A		
[maʊ]	4	4	18.18	18.18
[daʊ]	2	6	9.09	27.27
[kaʊ]	2	8	9.09	36.36
[saʊ]	2	10	9.09	45.45
[raʊ]	2	12	9.09	54.54
[paʊ]	1	13	4.55	59.09
[baʊ]	1	14	4.55	63.64
[taʊ]	1	15	4.55	68.19
[faʊ]	1	16	4.55	72.74
[ʃaʊ]	1	17	4.55	77.29
[haʊ]	1	18	4.55	81.84
[braʊ]	1	19	4.55	86.39
[klaʊ]	1	20	4.55	90.94
[kraʊ]	1	21	4.55	95.49
[graʊ]	1	22	4.55	100.00
		F/A		
[haʊ]	2	2	25.00	25.00
[paʊ]	1	3	12.50	37.50
[θaʊ]	1	4	12.50	50.00
[ðaʊ]	1	5	12.50	62.50
[naʊ]	1	6	12.50	75.00
[laʊ]	1	7	12.50	87.50
[flaʊ]	1	8	12.50	100.00

TABLE 42.--/ɔɪ/-Consonant Combinations by Syllabic Position and Stress

Context	f	Cf	%	Cum. %
		I/A		
[ɔɪl]	1	1	100.00	100.00
		M/A		
[pɔɪ]	1	1	25.00	25.00
[dʒɔɪ]	1	2	25.00	50.00
[vɔɪ]	1	3	25.00	75.00
[sɔɪ]	1	4	25.00	100.00
		F/A		
[dʒɔɪ]	2	2	50.00	50.00
[bɔɪ]	1	3	25.00	75.00
[strɔɪ]	1	4	25.00	100.00

The type-token relationship stated above for consonants also holds true for vowels. The relationship shows itself most strikingly in the Medial/Accented category: for all of the 15 vowels which occur in the category except /ɔɪ/, one-third or less of the types account for 50% of the tokens. For five of the 13 vowels which occur in the Initial/Accented category, one-third or less of the types account for 50% of the tokens. When /ə/ occurs in the initial position of unaccented syllables, 11% of the types account for 50% of the tokens; for /l/, 17% of the types do so.

When /ə/ and /I/ occur in the Medial/Unaccented category, 24% and 27%, respectively, of the types account for 50% of the tokens. Of the 11 vowels which occur in the Final/Accented category, four have 33% or less of the types accounting for 50% of the tokens. Two vowels of the six occurring in the final position of unaccented syllables have one-third or less of the types accounting for 50% of the tokens.

High- and Low-Frequency Vowel Contexts of Consonants

Tables 43 through 36 show the vowel contexts which occur with high relative frequency with consonants in the four position/stress categories. "High frequency," for purposes of this analysis was operationally defined as those vowel contexts which occurred with a relative frequency of greater than 13%. This seemingly low criterion for high frequency was necessitated by the fact that for several consonants, occurring in accented syllables, the vowel contexts are rather widely and evenly represented, with the result that the highest relative frequency for any one context is just over 13% (e.g., see Table 3a). The tables are presented in matrix form, matching each consonant with each vowel, forming a CV or VC context for the initial and final consonants, respectively. An "x" in any cell of the matrix indicates a high-frequency vowel context. The horizontal "Total" figures represent the number of consonants with which a particular vowel occurs with high frequency. The vertical "Total" figures represent the number of vowels with a particular consonant occurs with high frequency.

Table 43 represents the high-frequency vowel contexts of consonants in the initial position of accented syllables. Consonants in the initial position of accented syllables combine with /I/ and /ɛ/ with high frequency at least twice as often as with other particular vowels. Every vowel context occurs with high frequency with at least one consonant.

The high-frequency vowel contexts of consonants occurring in the initial position of unaccented syllables is presented in Table 44. Table 44 shows that consonants in the initial position of unaccented syllables combine with relatively few vowels with high frequency. Of the seven vowels they do combine with, /I/, /ɚ/, and /ə/ combine with many more consonants relative to /ɛ/, /o/, /U/, and /aU/. Of the 50 high-frequency vowel contexts shown, /I/, /ɚ/, and /ə/ account for 84%.

Table 45 indicates that all vowels except /ɔI/ combine with high frequency with at least one consonant in the final position of accented syllables. The vowels /I/ and /ɛ/ are most often high-frequency contexts with final consonants in accented syllables, accounting for 42% of the high-frequency contexts.

High-frequency vowel contexts of consonants in the final position of unaccented syllables are shown in Table 46. Only two contexts, /I/ and /ə/, are high-frequency contexts of more than one consonant. The /I/ and /ə/ contexts account for 77% of the high-frequency vowel contexts of final consonants in unaccented syllables. The /i/, /ɛ/, /o/, /U/, /u/, /aU/, and /ɔI/ contexts are not high-frequency contexts with any consonants.

TABLE 43.--High Frequency Vowel Contexts of Consonants in the Initial Position of Accented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ʌ	aI	aU	ɔI	Total
p			x													1
b		x														1
t		x	x													2
d		x	x													2
k					x		x					x				3
g			x	x		x		x								4
f		x														1
v		x		x	x								x			4
θ		x			x		x				x			x		5
ð	x			x												2
s		x		x												2
z		x			x							x	x			4
ʃ								x	x							2
ʒ																0
h		x		x	x											3
tʃ				x												1
dʒ				x		x					x	x			x	5
m		x		x												2
n								x								1
l				x			x									2
w		x														1
hw				x									x			2
j			x							x						2
r	x			x												2
Total	2	11	5	11	5	2	3	3	1	1	2	3	3	1	1	54
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ʌ	aI	aU	ɔI	

TABLE 44.--High Frequency Vowel Contexts of Consonants in the Initial Position of Unaccented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	Total
p											x	x				2
b		x									x	x				3
t		x									x	x				3
d		x									x	x				3
k												x				1
g								x			x					2
f								x			x	x				3
v		x									x	x				3
θ		x									x					2
ð											x	x				2
s											x	x				2
z		x										x				2
ʃ												x				1
ʒ									x							1
h		x									x			x		3
tʃ											x	x				2
dʒ		x		x							x					3
m												x				1
n		x									x					2
l		x										x				2
w		x									x					2
hw				x												1
j									x		x	x				3
r		x														1
Total	0	12	0	2	0	0	0	2	2	0	16	15	0	1	0	50
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	

TABLE 45.--High Frequency Vowel Contexts of Consonants in the Final Position of Accented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ʌ	aI	aU	ɔI	Total
p	x				x	x										4
b						x						x				2
t												x				1
d				x									x			2
k		x	x	x												3
g		x		x	x		x		x							5
f					x											1
v				x								x		x		2
θ				x						x	x					4
ð				x	x							x				3
s		x		x												2
z		x						x		x						3
ʃ		x		x		x										3
ʒ				x												1
tʃ	x	x			x							x				4
dʒ		x	x	x								x				4
m			x									x				2
n		x		x												2
ŋ		x					x					x				3
l		x					x	x								3
r		x		x			x									3
Total	2	12	3	12	5	3	4	2	1	2	1	8	1	1	0	57
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ə	aI	aU	ɔI	

TABLE 46.--High-Frequency Vowel Contexts of Consonants in the Final Position of Unaccented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	Total
p												x				1
b																0
t		x				x										2
d											x	x				2
k		x										x				2
g		x										x				2
f					x											1
v		x														1
θ																0
ð		x														1
s		x										x				2
z		x	x										x			3
ʃ		x														1
ʒ																0
tʃ																0
dʒ		x														1
m		x										x				2
n		x										x				2
ŋ		x														1
l							x					x				2
r																0
Total	0	12	1	0	1	1	1	0	0	0	1	8	1	0	0	26
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	

Considering Tables 43 through 46 as a whole it can be seen that the general pattern is for a particular vowel to occur with high frequency with slightly more consonants in accented syllables than in unaccented syllables. The most notable exception to the pattern is /ɪ/, which forms a high-frequency context of approximately the same number of consonants regardless of position or stress. A further observation is that front and central vowels tend to combine with high frequency with more consonants than do the back vowels and diphthongs.

Tables 47 through 50 show the vowel contexts which occur with low frequency with consonants in the four position/stress categories. "Low frequency," for purposes of this analysis was operationally defined as those vowel contexts which occurred with a relative frequency of less than two percent. The tables are constructed in the same manner as those for high-frequency vowel contexts. An "x" in any cell of the matrix indicates a low-frequency vowel context. The horizontal "Total" figures represent the number of consonants with which a particular vowel occurs with a low frequency. The vertical "Total" figures represent the number of vowels with which a particular consonant occurs with low frequency.

Table 47 shows that all vowels combine with low frequency with at least two consonants. The vowel /ɔɪ/ combines with low frequency with 19 of the 24 consonants. Other vowels which combine with a relatively large number of consonants with low frequency are /U/, /u/, /ɚ/, and /aU/.

TABLE 47.--Low Frequency Vowel Contexts of Consonants in the Initial Position of Accented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ʌ	aI	aU	ɔI	Total
p										x						2
b										x						1
t					x										x	2
d											x				x	2
k											x					1
g	x									x				x	x	4
f												x		x	x	3
v	x		x			x	x		x	x	x	x		x		9
θ	x		x	x		x		x	x	x		x	x		x	10
ð						x	x		x	x	x	x			x	7
s					x	x			x						x	4
z	x		x	x		x	x	x	x	x	x			x	x	11
ʃ							x				x	x	x		x	5
ʒ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	15
h			x						x	x					x	4
tʃ							x	x	x	x		x		x	x	7
dʒ	x	x	x		x			x	x	x			x	x		9
m									x		x				x	3
n									x		x				x	3
l									x	x	x			x	x	5
w					x					x				x	x	4
hw	x		x		x		x	x	x	x	x	x		x	x	11
j	x		x		x			x			x		x	x	x	8
r									x		x				x	3
Total	8	2	8	3	7	6	7	7	14	14	13	8	6	11	19	133
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ʌ	aI	aU	ɔI	

Table 48 shows that consonants in the initial position of unaccented syllables have few vowel contexts which occur with a relative frequency of two percent or greater. Of the 360 cells in the matrix, 298 represent low-frequency contexts. The /i/, /æ/, /ɔ/, and /ɔɪ/ contexts are low frequency contexts with all the consonants. Contexts which are low frequency with the fewest number of consonants are /ɪ/, /ɚ/, and /ə/, accounting for only 8.5% of the low-frequency contexts.

The occurrence of low frequency vowel contexts of final consonants of accented syllables is shown in Table 49. All contexts are low frequency with at least three consonants. The contexts which are low-frequency contexts with the most consonants are /ɔɪ/, /aU/, and /ɝ/. Those which are low-frequency contexts with the fewest consonants are /I/, /ɛ/, and /æ/.

Table 50 shows that five vowels (/i/, /ɛ/, /U/, /aU/, and /ɔɪ/) combine with low frequency with all consonants in the final position of accented syllables. Ten of the fifteen vowels occur with low frequency in combination with at least nineteen of the consonants. The vowel which combines with low frequency with the fewest number of consonants is /ɪ/ (8), followed by /ə/, which forms a low-frequency context with 12 consonants.

When Tables 47 through 50 are considered together, it is observed that except for /ɔɪ/, vowels tend to combine with low frequency with more consonants in unaccented than accented syllables. This is consistent with

TABLE 48.--Low Frequency Vowel Contexts of Consonants in the Final Position of Unaccented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	Total
p	x	x		x	x	x	x	x	x	x			x	x	x	12
b	x		x	x	x	x	x	x	x	x			x	x	x	12
t	x		x	x	x	x	x	x	x					x	x	10
d	x		x	x	x	x	x		x	x			x	x	x	11
k	x			x	x	x	x	x	x	x	x		x	x	x	12
g	x	x	x	x	x	x	x		x	x		x	x	x	x	13
f	x	x	x	x	x	x	x		x	x			x	x	x	12
v	x		x	x	x	x	x	x	x	x			x	x	x	12
θ	x		x	x	x	x	x	x	x	x		x	x	x	x	13
ð	x	x	x	x	x	x	x	x	x	x			x	x	x	13
s	x	x	x		x	x	x		x	x			x	x	x	11
z	x		x	x	x	x	x	x	x	x	x		x	x	x	13
ʃ	x	x	x	x	x	x	x	x	x	x	x		x	x	x	14
ʒ	x	x	x	x	x	x	x	x		x	x	x	x	x	x	14
h	x		x	x	x	x	x	x	x	x		x	x		x	12
tʃ	x	x	x	x	x	x	x	x	x	x			x	x	x	13
dʒ	x		x		x	x	x	x	x	x		x	x	x	x	12
m	x		x	x	x	x	x		x	x			x	x	x	11
n	x		x	x	x	x	x	x	x	x		x	x	x	x	13
l	x		x	x	x	x	x	x	x	x	x			x	x	12
w	x		x	x	x	x	x	x	x	x		x	x	x	x	13
hw	x	x	x	x	x		x	x	x	x	x	x	x	x	x	14
j	x	x	x	x	x	x	x	x		x			x	x	x	12
r	x		x	x	x	x	x		x	x	x		x	x	x	12
Total	24	10	22	22	24	23	24	18	22	23	7	8	22	23	24	298
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	

TABLE 49.--Low Frequency Vowel Contexts of Consonants in the Final Position of Accented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ʌ	aI	aU	ɔI	Total
p							x		x		x			x	x	5
b	x	x	x	x	x		x	x	x	x	x		x	x	x	13
t											x				x	2
d							x	x							x	3
k										x		x		x	x	4
g	x		x			x		x		x	x	x	x	x	x	10
f	x	x	x	x		x	x	x	x	x	x	x	x	x	x	14
v							x	x	x					x	x	5
θ	x	x	x			x	x		x				x		x	8
ð	x		x			x	x	x	x	x	x		x	x	x	11
s									x		x					2
z						x			x		x			x	x	5
ʃ	x		x				x	x	x	x	x		x	x	x	10
ʒ	x	x	x		x	x	x	x	x	x	x	x	x	x	x	14
tʃ			x	x			x	x	x	x			x	x	x	9
dʒ	x				x	x	x	x	x	x	x		x	x	x	11
m							x				x			x	x	4
n							x		x						x	3
ŋ	x		x	x		x		x	x	x	x		x	x	x	11
l											x	x		x		3
r	x		x							x	x	x			x	6
Total	10	4	10	4	3	8	13	11	14	11	15	6	10	15	19	153
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɝ	ʌ	aI	aU	ɔI	

TABLE 50.--Low Frequency Vowel Contexts of Consonants in the Final Position of Unaccented Syllables

	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	Total
p	x	x	x	x	x	x	x	x	x	x	x		x	x	x	14
b	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	15
t	x		x	x	x		x	x	x			x	x	x	x	11
d	x		x	x	x	x	x		x	x			x	x	x	11
k	x		x	x	x	x	x	x	x	x	x		x	x	x	13
g	x		x	x	x	x	x	x	x	x	x		x	x	x	13
f	x	x	x	x		x	x	x	x	x	x	x	x	x	x	14
v	x		x	x	x	x	x	x	x	x	x	x	x	x	x	14
θ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	15
ð	x		x	x	x	x	x	x	x	x	x	x	x	x	x	14
s	x			x	x	x	x	x	x	x	x		x	x	x	12
z	x			x					x					x	x	5
ʃ	x		x	x	x	x	x	x	x	x	x	x	x	x	x	14
ʒ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	15
tʃ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	15
dʒ	x		x	x	x	x	x	x	x	x	x	x	x	x	x	14
m	x		x	x	x	x	x	x	x	x	x		x	x	x	13
n	x		x	x	x	x	x	x	x	x			x	x	x	12
ŋ	x		x	x	x	x	x	x	x	x	x	x	x	x	x	14
l	x	x	x	x	x	x		x	x	x	x		x	x	x	13
r	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	15
Total	21	8	19	21	19	19	19	19	21	19	17	12	20	21	21	276
	i	I	e	ɛ	æ	ɑ	ɔ	o	U	u	ɚ	ə	aI	aU	ɔI	

the observations made concerning high-frequency contexts. It can be further noted that /I/ and the central vowels consistently form low-frequency contexts with the fewest number of consonants.

When considering the two sets of data as a whole (Tables 43 through 50), the reader should guard against the assumption that if a particular context is not a low-frequency context, then it must be a high-frequency context, and vice versa. It must be remembered that the criterion for low-frequency contexts was a frequency of less than two percent and that for high-frequency contexts was a frequency of greater than 13%. This results in a trichotomy of the variable of relative frequency of occurrence with a middle range of two to thirteen percent. The vowel /I/ consistently combines with more consonants in each of the four position/stress categories with high frequency than with low frequency. The back vowels, the diphthongs, /i/, and /e/ consistently combine with more consonants in each of the four position/stress categories with low frequency than with high frequency. The central vowel /ɝ/ combines with more consonants in both positions with low frequency. The vowel /ʌ/ combines with more consonants in accented syllables (regardless of position) with high frequency than with low frequency. In unaccented syllables, /ə/ combines with more consonants with low frequency. The vowel /æ/ combines with more final consonants in accented syllables with high frequency than with low frequency; however, in each of the other three position/stress categories,

its proportions are reversed. The two unstressed central vowels, /ɚ/ and /ə/, combine with more consonants in the initial position with high frequency than with low, and more consonants in the final position with low frequency than with high. The proportions for the stressed central vowel /ʌ/ are reversed, showing that it combines with more consonants in the final position with high frequency, and more consonants in the initial position with low frequency than with high.

Relative Frequency of Occurrence of Phonemes

Table 51 shows the relative frequency of occurrence for all phonemes. Vowels comprise 36.51% of the sample and consonants 63.47%. Five of the phonemes (/t/, /ɪ/, /n/, /r/, and /s/) occur with a frequency of greater than five percent. Thirteen of the 44 phonemes occur with a frequency of less than one percent.

Table 52 shows the relative frequency of occurrence of consonants in relation to the total occurrences of consonants. Four of the consonants (/t/, /n/, /s/, /r/) occur with a relative frequency of more than 10%. These four consonants account for 43.08% of the consonant occurrences. Four additional consonants (/d/, /l/, /k/, and /m/) occur with relative frequencies of greater than five percent, but less than ten percent. These eight most frequently occurring consonants account for 69.26% of the total occurrences of consonants.

TABLE 51.--Relative Frequency of Occurrence of Phonemes

Phoneme	%	(N)	Phoneme	%	(N)
/p/	2.41	(98)	/w/	1.55	(63)
/b/	2.17	(88)	/hw/	0.22	(9)
/t/	7.39	(300)	/j/	0.99	(40)
/d/	4.73	(192)	/r/	6.63	(269)
/k/	3.79	(154)	/i/	2.00	(81)
/g/	1.38	(56)	/I/	7.00	(284)
/f/	2.07	(84)	/e/	2.14	(87)
/v/	1.40	(57)	/ɛ/	3.74	(152)
/θ/	0.67	(27)	/æ/	2.17	(88)
/ð/	0.81	(33)	/ɑ/	1.77	(72)
/s/	6.35	(258)	/ɔ/	1.77	(72)
/z/	1.26	(51)	/o/	2.19	(89)
/ʃ/	0.99	(40)	/U/	0.62	(25)
/ʒ/	0.07	(3)	/u/	1.35	(55)
/h/	1.23	(50)	/ɝ/	0.76	(31)
/tʃ/	0.79	(32)	/ɚ/	2.36	(96)
/dʒ/	0.74	(30)	/ə/	3.69	(150)
/m/	3.35	(136)	/ʌ/	1.75	(71)
/n/	6.92	(281)	/aI/	2.12	(86)
/ŋ/	0.86	(35)	/aU/	0.86	(35)
/l/	4.70	(191)	/ɔI/	0.22	(9)
			Total	100.00	(4060)

TABLE 52.--Relative Frequency of Occurrence of Consonants

Consonant	%	(N)	Consonant	%	(N)
/p/	3.80	(98)	/ʒ/	0.12	(3)
/b/	3.41	(88)	/h/	1.94	(50)
/t/	11.64	(300)	/tʃ/	1.24	(32)
/d/	7.45	(192)	/dʒ/	1.16	(30)
/k/	5.98	(154)	/m/	5.28	(136)
/g/	2.17	(56)	/n/	10.90	(281)
/f/	3.26	(84)	/ŋ/	1.36	(35)
/v/	2.21	(57)	/l/	7.41	(191)
/θ/	1.05	(27)	/w/	2.44	(63)
/ð/	1.28	(33)	/hw/	0.35	(9)
/s/	10.01	(258)	/j/	1.55	(40)
/z/	1.98	(51)	/r/	10.44	(269)
/ʃ/	1.55	(40)	Total	100.00	(2577)

Table 53 shows the relative frequency of occurrence of vowels.

TABLE 53.--Relative Frequency of Occurrence of Vowels

Vowel	%	(N)	Vowel	%	(N)
/i/	5.46	(81)	/u/	3.71	(55)
/ɪ/	19.15	(284)	/ɝ/	2.09	(31)
/e/	5.87	(87)	/ɚ/	6.47	(96)
/ɛ/	10.25	(152)	/ə/	10.11	(150)
/æ/	5.93	(88)	/ʌ/	4.79	(71)
/ɑ/	4.86	(72)	/aɪ/	5.80	(86)
/ɔ/	4.86	(72)	/aʊ/	2.36	(35)
/o/	6.00	(89)	/ɔɪ/	0.61	(9)
/ʊ/	1.69	(25)	Total	100.00	(1483)

The vowel /I/ alone accounts for almost 20% of the occurrences of vowels. The vowels /ɛ/ and /ə/ account for 10.25% and 10.11%, respectively, of the occurrences of vowels. These three vowels account 39.51% of the vowel occurrences. Nine vowels (/I/, /ɛ/, /ə/, /ɚ/, /o/, /æ/, /e/, /aI/, and /i/) each account for at least five percent of the vowel occurrences, and, in all, account for 75.04% of the total vowel occurrences. Of the nine vowels, five are front, two central, one back, and one is a diphthong.

Five studies reporting data on the frequency of occurrence of phonemes were cited in Chapter II. In comparing the findings of the present study concerning frequency of occurrence of all phonemes, only the data reported by Tobias (1959) can be used. Other studies either did not consider vowels (Mader, 1954), did not consider consonants and vowels together (Faircloth, 1970), or did not use transcription systems which are compatible with the IPA alphabet for vowels (Dewey, 1923; French, et al., 1930, as reported by Fletcher, 1953).

Table 54 presents the ten most frequently occurring phonemes of the present study and those of the Tobias (1959) study. Tobias reported relative frequency distributions for his retranscription of the French, et al. (1930) words, as well as his conversion of the French, et al. transcription to the IPA alphabet.

TABLE 54.--Comparison of Rank Ordering of Ten Most Frequently Occurring Phonemes

Rank	Present Study	Tobias	French, et al.
1	/t/	/ɪ/	/t/
2	/ɪ/	/t/	/ə/
3	/n/	/ə/	/n/
4	/r/	/n/	/ɪ/
5	/s/	/d/	/r/
6	/d/	/s/	/l/
7	/l/	/l/	/d/
8	/k/	/ð/	/ð/
9	/ɛ/	/r/	/s/
10	/ə/	/m/	/m/

Although the rank orderings of the three lists differ considerably, there are eight phonemes common to the three lists.

Table 55 shows the ten most frequently occurring consonants for the present study in comparison with those of five previous studies. It should be noted that the rank-orderings for the French et al. (1930) study as recomputed by Fletcher (1953) differ from those as recomputed by Tobias (1959). Consequently, both lists are presented. The same two consonants, /t/ and /n/, occupy the first two ranks in each of the seven lists. Although the rank-orderings of the seven lists differ considerably, eight sounds are common to the seven lists.

Table 56 shows the five most frequently occurring vowels of the present study in comparison to those of three previous studies. With the exception of the Faircloth (1970) rank-ordering, the same vowels are contained in the first three ranks.

TABLE 55.--Comparison of Rank Ordering of Ten Most Frequently Occurring Consonants

Rank	Present Study	Dewey	French et al.[1]	Tobias	French et al.[2]	Mader	Faircloth
1	/t/	/n/	/t/	/t/	/t/	/n/	/n/
2	/n/	/t/	/n/	/n/	/n/	/t/	/t/
3	/r/	/r/	/r/	/d/	/r/	/d/	/d/
4	/s/	/s/	/d/	/s/	/l/	/r/	/s/
5	/d/	/d/	/l/	/l/	/d/	/s/	/w/
6	/l/	/l/	/s/	/ð/	/ð/	/ð/	/r/
7	/k/	/ð/	/w/	/r/	/s/	/l/	/m/
8	/m/	/z/	/k/	/m/	/m/	/w/	/ð/
9	/p/	/m/	/m/	/k/	/k/	/m/	/k/
10	/f/	/k/	/ð/	/w/	/w/	/k/	/l/

[1]As computed by Fletcher (1953)

[2]As computed by Tobias (1959)

TABLE 56.--Comparison of Rank Ordering of Five Most Frequently Occurring Vowels

Rank	Present Study	Tobias	French et al.*	Faircloth
1	/ɪ/	/ɪ/	/ə/	/ɪ/
2	/ɛ/	/ə/	/ɪ/	/ə/
3	/ə/	/ɛ/	/ɛ/	/æ/
4	/æ/	/aɪ/	/aɪ/	/aɪ/
5	/o/	/ɔ/	/æ/	/i/

*As computed by Tobias (1959)

The differences between the present study and previous studies in the rank-orderings of phonemes, consonants, and vowels can be largely explained by differences in methodology. The analysis of the present study was done on the basis of the number of different words. All of the previous studies used the total number of words as the basis for analysis. The possible exception to this is the Faircloth (1970) study for which the basis analysis is not known, but is inferred to be the total number of words because of its agreement with other previous studies. When the basis for analysis is the total number of words, the occurrence of a particular phoneme in a word is weighted by the number of occurrences of the word. Thus, the occurrence of a phoneme in words which occur very frequently will be reflected in the relative frequency of the phoneme. This appears to be the case with /ð/ and /w/. Considering only the 130 words of the French et al. (1930) study which occurred more than 100 times, nine contain /ð/ and account for 6,306 of the total 79,390 words; 11 contain /w/ and account for 5,018 of the total words.

Taking into account the basic methodological difference between the present study and previous studies, the amount of agreement is somewhat surprising and is indicative of the lawfulness with which phonemes occur in the language.

Distribution of Consonants on Syllabic Variables

This section describes the distribution of consonants on the following syllabic variables: (1) type of combination (consonant-vowel versus consonant blend) in which consonants occur, (2) syllabic position, (3) stress of syllables in which consonants occur, (4) occurrence of consonants in the four position/stress categories.

Consonant-Vowel Combinations Versus Consonant Blends

In the total sample of consonant occurrences, 72.22% occur as singles (consonant-vowel combinations) and 27.78% occur in blends. Table 57 shows the distribution of each consonant in singles and in blends. For all the consonants, singles are more frequent than blends. Five consonants (/ʃ/, /ʒ/, /hw/, and /ŋ/) do not occur in blends. All of these five consonants occur with a relative frequency of less than two percent in relation to the total occurrences of consonants (see Table 52). Of the 25 consonants, 20 have at least 70% of their occurrences in the form of singles.

Initial Versus Final Position

In the total occurrences of consonants there are 52.89% in the initial syllabic position and 47.11% in the final position. Table 58 shows the relative frequency of occurrence of the consonants in the initial and final syllabic positions. As would be expected, /ŋ/, does not occur in the initial position, and /h/, /w/, /hw/, and /j/ do not occur in the final position.

TABLE 57.--Relative Frequency of Occurrence of Consonants in Singles vs. Blends

	Singles		Blends			Singles		Blends	
C	%	(N)	%	(N)	C	%	(N)	%	(N)
/p/	76.5	(75)	23.5	(23)	/ʒ/	100.0	(3)	0	(0)
/b/	79.5	(70)	20.5	(18)	/h/	98.0	(49)	2.0	(1)
/t/	59.7	(179)	40.3	(121)	/tʃ/	87.5	(28)	12.5	(4)
/d/	69.8	(134)	30.2	(58)	/dʒ/	83.3	(25)	16.7	(5)
/k/	70.8	(109)	29.2	(45)	/m/	91.2	(124)	8.8	(12)
/g/	73.2	(41)	26.8	(15)	/n/	72.6	(204)	27.4	(77)
/f/	71.4	(60)	28.6	(24)	/ŋ/	100.0	(35)	0	(0)
/v/	94.7	(54)	5.3	(3)	/l/	71.7	(137)	28.3	(54)
/θ/	81.5	(22)	18.5	(5)	/w/	82.5	(52)	17.5	(11)
/ð/	100.0	(33)	0	(0)	/hw/	100.0	(9)	0	(0)
/s/	62.0	(160)	38.0	(98)	/j/	57.5	(23)	42.5	(17)
/z/	96.1	(49)	3.9	(2)	/r/	54.3	(146)	45.7	(123)
/ʃ/	100.0	(40)	0	(0)	All	72.2	(1861)	27.8	(716)

TABLE 58.--Relative Frequency of Occurrence of Consonants in Initial vs. Final Position

	Initial		Final			Initial		Final	
C	%	(N)	%	(N)	C	%	(N)	%	(N)
/p/	72.4	(71)	27.6	(27)	/ʒ/	33.3	(1)	66.7	(2)
/b/	90.9	(80)	9.1	(8)	/h/	100.0	(50)	0	(0)
/t/	40.0	(120)	60.0	(180)	/tʃ/	40.6	(13)	59.4	(19)
/d/	38.0	(73)	62.0	(119)	/dʒ/	63.3	(19)	36.7	(11)
/k/	57.8	(89)	42.2	(65)	/m/	63.2	(86)	36.8	(50)
/g/	83.9	(47)	16.1	(9)	/n/	18.5	(52)	81.5	(229)
/f/	88.1	(74)	11.9	(10)	/ŋ/	0	(0)	100.0	(35)
/v/	29.8	(17)	70.2	(40)	/l/	47.6	(91)	53.4	(100)
/θ/	48.2	(13)	51.8	(14)	/w/	100.0	(63)	0	(0)
/ð/	69.7	(23)	30.3	(10)	/hw/	100.0	(9)	0	(0)
/s/	58.9	(152)	41.1	(106)	/j/	100.0	(40)	0	(0)
/z/	15.7	(8)	84.3	(43)	/r/	54.6	(147)	45.4	(122)
/ʃ/	62.5	(25)	37.5	(15)	All	53.9	(1363)	47.1	(1214)

All five of the bilabial sounds are represented in these 15. Ten of the 25 consonants have more than half of their occurrences in the final position. In these ten consonants are represented seven of the ten alveolar sounds. Five of the nine fricatives are represented in these ten consonants.

Table 59 shows the relative frequency of consonants which occur as singles in the initial and final syllabic positions.

TABLE 59.--Relative Frequency of Occurrence of Single Consonants in Initial vs. Final Position

	Initial		Final			Initial		Final	
C	%	(N)	%	(N)	C	%	(N)	%	(N)
/p/	69.3	(52)	30.7	(23)	/ʒ/	33.3	(1)	66.7	(2)
/b/	88.6	(62)	11.4	(8)	/h/	100.0	(49)	0	(0)
/t/	42.4	(76)	57.5	(103)	/tʃ/	46.4	(13)	53.6	(15)
/d/	45.5	(61)	54.5	(73)	/dʒ/	76.0	(19)	24.0	(6)
/k/	56.9	(62)	43.1	(47)	/m/	66.1	(82)	33.9	(42)
/g/	78.0	(32)	22.0	(9)	/n/	22.6	(46)	77.4	(158)
/f/	96.7	(58)	3.3	(2)	/ŋ/	0	(0)	100.0	(35)
/v/	29.6	(16)	70.4	(38)	/l/	47.4	(65)	52.6	(72)
/θ/	50.0	(11)	50.0	(11)	/w/	100.0	(52)	0	(0)
/ð/	69.7	(23)	30.3	(10)	/hw/	100.0	(9)	0	(0)
/s/	63.1	(101)	36.9	(59)	/j/	100.0	(23)	0	(0)
/z/	16.3	(8)	83.7	(41)	/r/	41.8	(61)	58.2	(85)
/ʃ/	62.5	(25)	37.5	(15)	All	54.1	(1007)	45.9	(854)

The proportions for the individual consonants in this table are very similar to those of Table 58, with the only significant change being the occurrence of slightly more final /r/'s than initial /r/'s.

Table 60 shows the relative frequency of consonants which occur as blends in the initial and final syllabic positions.

TABLE 60.--Relative Frequency of Occurrence of Blend Consonants in Initial vs. Final Position

	Initial		Final			Initial		Final	
C	%	(N)	%	(N)	C	%	(N)	%	(N)
/p/	82.6	(19)	17.4	(4)	/z/	0	(0)	100.0	(2)
/b/	100.0	(18)	0	(0)	/h/	100.0	(1)	0	(0)
/t/	36.4	(44)	63.6	(77)	/ʧ/	0	(0)	100.0	(4)
/d/	20.7	(12)	79.3	(46)	/ʤ/	0	(0)	100.0	(5)
/k/	60.0	(27)	40.0	(18)	/m/	33.3	(4)	66.7	(8)
/g/	100.0	(15)	0	(0)	/n/	7.8	(6)	92.2	(71)
/f/	66.7	(16)	33.3	(8)	/l/	48.1	(26)	51.8	(28)
/v/	33.3	(1)	66.7	(2)	/w/	100.0	(11)	0	(0)
/ɵ/	40.0	(2)	60.0	(3)	/j/	100.0	(17)	0	(0)
/s/	52.0	(51)	48.0	(47)	/r/	69.9	(86)	30.1	(37)
					All	49.7	(356)	50.3	(360)

Of the 20 consonants which occur in blends, five occur only in the initial position (/b/, /g/, /h/, /w/, /j/). Three consonants (/z/, /ʤ/, and /ʧ/) occur only in the final position. Of the 12 consonants which occur in both the initial and final positions, six occur more frequently in the initial position and six occur more frequently in the final position. When this table is compared to Table 58, we see that, with the exception of /t/ and /m/, all consonants maintain the direction of their proportions.

Accented Versus Unaccented Syllabic Stress

In the total occurrences of consonants, 82.46% occur in accented syllables, while only 17.54% occur in unaccented syllables.

Table 61 shows the relative frequency of occurrence of consonants in accented and unaccented syllables.

TABLE 61.--Relative Frequency of Occurrence of Consonants in Accented vs. Unaccented Syllables

	Accented		Unaccented			Accented		Unaccented	
C	%	(N)	%	(N)	C	%	(N)	%	(N)
/p/	83.7	(82)	16.3	(16)	/ʒ/	66.7	(2)	33.3	(1)
/b/	72.7	(64)	27.3	(24)	/h/	94.0	(47)	6.0	(3)
/t/	77.0	(231)	23.0	(69)	/ʧ/	87.5	(28)	12.5	(4)
/d/	78.6	(151)	21.4	(41)	/ʤ/	83.3	(25)	16.7	(5)
/k/	83.7	(129)	16.3	(25)	/m/	81.6	(111)	18.4	(25)
/g/	87.5	(49)	12.5	(7)	/n/	74.0	(208)	26.0	(73)
/f/	94.0	(79)	6.0	(5)	/ŋ/	57.1	(20)	42.9	(15)
/v/	89.5	(51)	10.5	(6)	/l/	85.3	(163)	14.7	(28)
/θ/	85.2	(23)	14.8	(4)	/w/	92.1	(58)	7.9	(5)
/ð/	72.7	(24)	27.2	(9)	/hw/	88.9	(8)	11.1	(1)
/s/	88.0	(227)	12.0	(31)	/j/	77.5	(31)	22.5	(9)
/z/	82.4	(42)	17.6	(9)	/r/	90.0	(242)	10.0	(27)
/ʃ/	75.0	(30)	25.0	(10)	All	82.5	(2125)	17.5	(452)

It can be seen that all consonants occur in both accented and unaccented syllables. Further, all consonants have the greater proportion of their occurrences in accented syllables. Of the 25 consonants, 23 have at least 70% of their occurrences in the accented syllable. Unaccented syllables account for at least six percent of occurrences of all consonants.

The relative frequency of consonants which occur as singles in accented and unaccented syllables is shown in Table 62.

TABLE 62.--Relative Frequency of Single Consonants in Accented vs. Unaccented Syllables

	Accented		Unaccented			Accented		Unaccented	
C	%	(N)	%	(N)	C	%	(N)	%	(N)
/p/	82.7	(62)	17.3	(13)	/ʒ/	66.7	(2)	33.3	(1)
/b/	68.6	(48)	31.4	(22)	/h/	93.9	(46)	6.1	(3)
/t/	68.7	(123)	31.3	(56)	/tʃ/	85.7	(24)	14.3	(4)
/d/	73.1	(98)	26.9	(36)	/dʒ/	80.0	(20)	20.0	(5)
/k/	78.0	(85)	22.0	(24)	/m/	80.6	(100)	19.4	(24)
/g/	87.8	(36)	12.2	(5)	/n/	71.1	(145)	28.9	(59)
/f/	91.7	(55)	8.3	(5)	/ŋ/	57.1	(20)	42.9	(50)
/v/	88.9	(48)	11.1	(6)	/l/	81.8	(112)	18.2	(25)
/θ/	81.8	(18)	18.2	(4)	/w/	90.4	(47)	9.6	(5)
/ð/	72.7	(24)	27.3	(9)	/hw/	88.9	(8)	11.1	(1)
/s/	84.4	(135)	15.6	(25)	/j/	69.6	(16)	30.4	(7)
/z/	83.7	(41)	16.3	(8)	/r/	87.0	(127)	13.0	(19)
/ʃ/	75.0	(30)	25.0	(10)	All	79.0	(1470)	21.0	(391)

The proportions in this table are very similar to those of Table 61, except that only 20 singles have at least 70% of their occurrences in accented syllables.

Table 63 shows the relative frequency of consonants which occur as blends in accented and unaccented syllables. Of the 20 consonants which occur as blends, 19 occur in the accented syllable with a relative frequency of 80% or more. The one consonant with less than 80% of its

occurrences in accented syllables, /z/, had only two actual blend occurrences, one in each category. Seven consonants do not occur as blends in unaccented syllables.

TABLE 63.--Relative Frequency of Blend Consonants in Accented vs. Unaccented Syllables

	Accented		Unaccented			Accented		Unaccented	
C	%	(N)	%	(N)	C	%	(N)	%	(N)
/p/	87.0	(20)	13.0	(3)	/z/	50.0	(1)	50.0	(1)
/b/	88.9	(16)	11.1	(2)	/h/	100.0	(1)	0	(0)
/t/	89.3	(108)	10.7	(13)	/tʃ/	100.0	(4)	0	(0)
/d/	91.4	(53)	8.6	(5)	/dʒ/	100.0	(5)	0	(0)
/k/	97.8	(44)	2.2	(1)	/m/	91.7	(11)	8.3	(1)
/g/	86.7	(13)	13.3	(2)	/n/	81.8	(63)	18.2	(14)
/f/	100.0	(24)	0	(0)	/l/	94.4	(51)	5.6	(3)
/v/	100.0	(3)	0	(0)	/w/	100.0	(11)	0	(0)
/θ/	100.0	(5)	0	(0)	/j/	88.2	(15)	93.5	(2)
/s/	93.9	(92)	6.1	(6)	/r/	93.5	(115)	6.5	(8)
					All	91.48	(655)	8.52	(61)

The Four Position/Stress Categories

For the total occurrences of consonants, 42.37% are in the initial position of accented syllables, 10.52% are in the initial position of unaccented syllables, 40.09% are in the final position of accented syllables, and 7.02% are in the final position of accented syllables. Table 64 shows the relative frequency of occurrence of the consonants in the four position/stress categories.

TABLE 64.--Relative Frequency of Consonants in Four Position/Stress Categories

	I/A		I/UA		F/A		F/UA	
C	%	(N)	%	(N)	%	(N)	%	(N)
/p/	57.14	(56)	15.31	(15)	26.53	(26)	1.02	(1)
/b/	63.64	(56)	27.27	(24)	9.09	(8)	0	(0)
/t/	25.00	(75)	15.00	(45)	52.00	(156)	8.00	(24)
/d/	23.96	(46)	14.06	(27)	54.69	(105)	7.29	(14)
/k/	48.70	(75)	9.09	(14)	35.06	(54)	7.14	(11)
/g/	75.00	(42)	8.93	(5)	12.50	(7)	3.57	(2)
/f/	83.33	(70)	4.76	(4)	10.71	(9)	1.19	(1)
/v/	21.05	(12)	8.77	(5)	68.42	(30)	1.75	(1)
/θ/	33.33	(9)	14.81	(4)	51.85	(14)	0	(0)
/ð/	48.48	(16)	21.21	(7)	24.24	(8)	6.06	(2)
/s/	53.88	(139)	5.04	(13)	34.11	(88)	6.98	(18)
/z/	7.84	(4)	7.84	(4)	74.51	(38)	9.80	(5)
/ʃ/	45.00	(18)	17.50	(7)	30.00	(12)	7.50	(3)
/ʒ/	0	(0)	33.33	(1)	66.67	(2)	0	(0)
/h/	94.00	(47)	6.00	(3)	0	(0)	0	(0)
/tʃ/	23.19	(9)	12.50	(4)	59.38	(19)	0	(0)
/dʒ/	50.00	(15)	13.33	(4)	33.33	(10)	3.33	(1)
/m/	50.00	(68)	13.24	(18)	31.62	(43)	5.15	(7)
/n/	15.66	(44)	2.85	(8)	58.36	(164)	23.13	(65)
/ŋ/	0	(0)	0	(0)	57.14	(20)	42.86	(15)
/l/	38.74	(74)	8.90	(17)	46.60	(89)	5.76	(11)
/w/	92.06	(58)	7.94	(5)	0	(0)	0	(0)
/hw/	88.89	(8)	11.11	(1)	0	(0)	0	(0)
/j/	77.50	(31)	22.50	(9)	0	(0)	0	(0)
/r/	44.61	(120)	10.04	(27)	45.35	(122)	0	(0)
All	42.37	(1092)	10.52	(271)	40.09	(1033)	7.02	(181)

As would be predicted from previous data presented, /ŋ/ does not occur in either of the initial position categories, and /h/, /w/, /hw/, and/j/ do not occur in either of the final position categories.

The Initial/Accented column shows that 11 consonants (/h/, /w/, /hw/, /f/, /j/, /g/, /b/, /p/, /s/, /dʒ/, and /m/) have one-half or more of their occurrences as initial consonants of accented syllables. All of the five bilabial sounds are represented in these 11 sounds. Twelve consonants (/k/, /ð/, /ʃ/, /r/, /l/, /θ/, /t/, /ʧ/, /d/, /v/, /n/, and /z/) of the 23 which occur in the initial position of accented syllables, have less than half their occurrences in this category. For three of the 12, however, the Initial/Accented category is the largest of the four. Seven of the ten alveolar sounds are represented in the 12.

The Initial/Unaccented column shows that no consonant has more than one-third of its occurrences as an initial consonant of an unaccented syllable. Further, 11 consonants have less than 10% of their occurrences in the Initial/Unaccented category.

Inspection of the Final/Accented column shows that no consonant has 75% or more of its occurrences as the final consonant of accented syllables. Nine consonants (/z/, /v/, /ʒ/, /ʧ/, /n/, /ŋ/, /d/, /t/, and /θ/) have more than one-half of their occurrences as the final consonants of accented syllables. Of these nine, six are alveolar consonants.

The Final/Unaccented column indicates that except for /ŋ/ and /n/, the consonants have less than ten percent of their occurrences as final consonants of unaccented syllables. Aside from the four consonants which do not occur in the final position, five (/b/, /θ/, /ʒ/, /ʧ/, /r/) do not occur in the Final/Unaccented category.

Table 65, which shows the relative frequency of consonants which occur as singles in the four position/stress categories, as very similar to Table 64.

TABLE 65.--Relative Frequency of Consonants in Four Position/Stress Categories

	I/A		I/UA		F/A		F/UA	
C	%	(N)	%	(N)	%	(N)	%	(N)
/p/	53.33	(40)	16.00	(12)	29.33	(22)	1.33	(1)
/b/	57.14	(40)	31.43	(22)	11.43	(8)	0	(0)
/t/	18.99	(34)	23.46	(42)	49.72	(89)	7.82	(14)
/d/	26.87	(36)	18.66	(25)	46.27	(62)	8.21	(11)
/k/	44.04	(48)	12.84	(14)	33.94	(37)	9.17	(10)
/g/	70.73	(29)	7.32	(3)	17.07	(7)	4.88	(2)
/f/	90.00	(54)	6.67	(4)	1.67	(1)	1.67	(1)
/v/	20.37	(11)	9.26	(5)	68.52	(37)	1.85	(1)
/θ/	31.82	(7)	18.18	(4)	50.00	(11)	0	(0)
/ð/	48.48	(16)	21.21	(7)	24.24	(8)	6.06	(2)
/s/	55.00	(88)	8.13	(13)	29.38	(47)	7.50	(12)
/z/	8.16	(4)	8.16	(4)	75.51	(37)	8.16	(4)
/ʃ/	45.00	(18)	17.50	(7)	30.00	(12)	7.50	(3)
/ʒ/	0	(0)	33.33	(1)	66.67	(2)	0	(0)
/h/	93.88	(46)	6.12	(3)	0	(0)	0	(0)
/tʃ/	32.14	(9)	14.29	(4)	53.57	(15)	0	(0)
/dʒ/	60.00	(15)	16.00	(4)	20.00	(5)	4.00	(1)
/m/	51.61	(64)	14.52	(18)	29.00	(36)	4.84	(6)
/n/	19.12	(39)	3.43	(7)	51.96	(106)	25.49	(52)
/ŋ/	0	(0)	. 0	(0)	57.14	(20)	42.86	(15)
/l/	37.23	(51)	10.22	(14)	44.53	(61)	8.03	(11)
/w/	90.38	(47)	9.62	(5)	0	(0)	0	(0)
/hw/	88.89	(8)	11.11	(1)	0	(0)	0	(0)
/j/	69.57	(16)	30.43	(7)	0	(0)	0	(0)
/r/	28.77	(42)	13.01	(19)	58.22	(85)	0	(0)
All	40.95	(762)	13.16	(245)	38.04	(708)	7.85	(146)

The Initial/Accented column shows the same direction of proportions for all the consonants. The Initial/Unaccented column shows essentially the same proportions except that /k/ and /l/ as singles are slightly more represented as initial consonants of unaccented syllables (above ten percent). The Final/Accented column shows the same direction of proportions except that /t/ and /d/ drop slightly below 50% representation and /r/ rises slightly above 50%. The Final/Unaccented solumn shows the same direction of proportions for all consonants.

Table 66 shows the relative frequency of consonants occurring as blends in the four position/stress categories. The Initial/Accented column shows that blend occurrences of /w/ and /h/ are entirely represented in this category. The /h/-distribution is based on only one occurrence, however, that of /w/ is based on 11 occurrences. Ten of the 20 consonants which occur as blends have 50% or more of their occurrences in the initial position of accented syllables. The Initial/Accented column, when compared with that of Table 65, shows several changes in the direction of proportions. The proportions of /r/ and /k/ when they occur as blends increases considerably in the Initial/Accented category; that of /m/ decreases. There are no blend occurrences of /ʤ/, /z/, and /t/ in the initial position of accented syllables.

The Initial/Unaccented column shows that, as blends, consonants have less than 14% of their occurrences in the initial position of unaccented syllables. Of the 20 consonants occurring as blends, 11 do not

occur in the initial position of unaccented syllables. In comparison with Table 64, the range of the proportions of occurrences of consonants as blends in the Initial/Unaccented category is reduced by slightly more than half.

TABLE 66.--Relative Frequency of Blend Consonants in Four Position/Stress Categories

	I/A		I/UA		F/A		F/UA	
C	%	(N)	%	(N)	%	(N)	%	(N)
/p/	69.57	(16)	13.04	(3)	17.39	(4)	0	(0)
/b/	88.89	(16)	11.11	(2)	0	(0)	0	(0)
/t/	33.88	(41)	2.48	(3)	55.37	(67)	8.26	(10)
/d/	17.24	(10)	3.45	(2)	74.14	(43)	5.17	(3)
/k/	60.00	(27)	0	(0)	37.78	(17)	2.22	(1)
/g/	86.67	(13)	13.33	(2)	0	(0)	0	(0)
/f/	66.67	(16)	0	(0)	33.33	(8)	0	(0)
/v/	33.33	(1)	0	(0)	66.67	(2)	0	(0)
/θ/	40.00	(2)	0	(0)	60.00	(3)	0	(0)
/s/	52.04	(51)	0	(0)	41.84	(41)	6.12	(6)
/z/	0	(0)	0	(0)	50.00	(1)	50.00	(1)
/h/	100.00	(1)	0	(0)	0	(0)	0	(0)
/tʃ/	0	(0)	0	(0)	100.00	(4)	0	(0)
/dʒ/	0	(0)	0	(0)	100.00	(5)	0	(0)
/m/	33.33	(4)	0	(0)	58.33	(7)	8.33	(1)
/n/	6.49	(5)	1.30	(1)	75.32	(58)	16.88	(13)
/l/	42.59	(23)	5.56	(3)	51.85	(28)	0	(0)
/w/	100.00	(11)	0	(0)	0	(0)	0	(0)
/j/	88.24	(15)	11.76	(2)	0	(0)	0	(0)
/r/	63.41	(78)	6.50	(8)	30.08	(37)	0	(0)
All	46.09	(330)	3.63	(26)	45.39	(325)	4.89	(35)

Inspection of the Final/Accented column shows that the two affricates, /tʃ/ and /dʒ/, have all of their occurrences in the final position of

accented syllables. Of the 20 consonants which occur as blends, ten (/tʃ/, /dʒ/, /n/, /d/, /v/, /θ/, /m/, /t/, /l/, and /z/) have 50% or more of their blend occurrences in the final position of accented syllables. Of the ten, seven are alveolar sounds. Expectedly, /h/, /w/, and /j/ do not occur in this category; also, however, /b/ and /g/ do not occur. In comparison with the Final/Accented column of Table 64, it can be seen that the proportion of /dʒ/ in this category increases by 67%, the proportion of /m/ increases considerably and there is a slight increase in the proportion of /l/ as a blend in the final position of accented syllables.

The striking feature of the Final/Unaccented column is that only seven consonants are represented in this category. With the exception of /z/, the consonants have less than 17% of their occurrences in the final position of unaccented syllables.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to determine the phonetic contexts, and the frequency with which each occurred, for 33 General American phonemes in the 1,002 most frequently occurring words of the language. Previous research indicated that phonetic context is a relevant variable in articulatory behavior and should be a primary consideration in the selection of stimuli for articulation testing and therapy. The literature further indicated that frequency of occurrence of phonetic contexts is an important phenomenon from both a linguistic and a clinical point of view.

The following questions were posed at the outset of the study:

1. What are the phonetic contexts of each phoneme to be analyzed in the 1,002 most frequently occurring words of American English?
   a. For the consonants, what are the phonetic contexts of each phoneme as a function of consonant-vowel combinations versus consonant blends?
   b. What are the phonetic contexts of each phoneme as a function of syllabic position and syllabic stress?

2. How do the obtained phonetic contexts rank order themselves with respect to frequency of occurrence?

a. For the consonants, how do the obtained phonetic contexts rank order themselves with respect to frequency of occurrence as a function of consonant-vowel combinations versus consonant blends?
b. How do the obtained phonetic contexts rank order themselves with respect to frequency of occurrence as a function of syllabic position and syllabic stress?

The 33 phonemes analyzed in this study were: /p/, /b/, /t/, /d/, /k/, /g/, /f/, /v/, /θ/, /ð/, /s/, /h/, /m/, /n/, /ŋ/, /w/, /hw/, /j/, /i/, /I/, /e/, /ɛ/, /æ/, /ɑ/, /ɔ/, /o/, /U/, /u/, /ə/, /ɚ/, /aI/, /aU/, and /ɔI/.

The words used were the 1,002 most frequently occurring words of the Thorndike-Lorge (1944) word list as analyzed by Griffith and Miner (1973c) according to occurrence of a particular phoneme in a word, the syllabic position of the phoneme, and the stress of the syllable in which occurred. The investigator determined the context of each occurrence of the 33 phonemes. The frequencies of the contexts were tabulated according to the syllabic position of the phoneme in question and the stress of the syllable in which the phoneme occurred.

The phonetic context distributions of each of the 33 phonemes were reported. In addition, the phonetic context distributions derived by Griffith and Miner (1973a) for /r/, /ɝ/, /ɚ/, /l/, /s/, /z/, /ʃ/, /ʧ/, and /ʤ/ were reported. The data of the present study and those of Griffith and Miner (1973a) were further subjected to the following descriptive analyses: (1) high- and low-frequency vowel contexts of consonants,

(2) frequency of occurrence of phonemes, and (3) distribution of consonants on syllabic variables. The results of these analyses were reported.

Conclusions

The following conclusions appear to be warranted by the present study:

1. The phonetic context distributions are such that, for many consonants and vowels, a relatively small number of different contexts account for a relatively large proportion of the total number of contexts in a particular position/stress category.
2. High-frequency of occurrence contexts combining vowels with consonants are such that front and central vowels, particularly /I/ and /ɛ/ tend to form high-frequency of occurrence contexts with more consonants than do the back vowels and diphthongs.
3. Conversely, low-frequency of occurrence contexts combining vowels with consonants are such that the back vowels and the diphthongs tend to form low-frequency of occurrence contexts with more consonants than the front and central vowels.
4. The relative frequency of occurrence of phonemes is such that:
   a. Vowels comprise 36.51% of the sample and consonants 63.47%.
   b. Five phonemes (/t/, /I/, /n/, /r/, and /s/) occur with a relative frequency of greater than five percent.

c. Thirteen of the 44 phonemes occur with a frequency of less than one percent.

5. The relative frequency of occurrence of consonants in relation to the total occurrences of consonants is such that eight consonants (/t/, /n/, /s/, /r/, /d/, /l/, /k/, /m/) of the 25 account for 69.25% of the total occurrences.

6. The relative frequency of occurrence of vowels in relation to the total number of vowel occurrences is such that:

   a. The vowel /ɪ/ alone accounts for almost 20% of the vowel occurrences.

   b. Nine vowels (/ɪ/, /ɛ/, /ə/, /ɚ/, /o/, /æ/, /e/, /aɪ/ and /i/) account for 75.04% of the vowel occurrences.

7. Comparison of the rank-orderings of phonemes, consonants, and vowels of the present study with those of previous studies indicates that the relative frequency of occurrence of phonemes is a lawful phenomenon which is not appreciably affected by the source of the word sample analyzed or the method of analysis (number of different words versus total number of words).

8. The distribution of consonants on the variable of type of combination (singles versus blends) is such that, for the 20 consonants which occur in both types, each has at least 70% of its occurrences in the form of singles.

9. The distribution of consonants on the syllabic variable of position is such that:
   a. For the total occurrences of consonants there is an almost equal distribution in the two positions.
   b. Considering the distributions for individual consonants, 15 consonants have more than half their occurrences in the initial position and ten consonants have more than half their occurrences in the final position.
      (1) Bilabial sounds tend to concentrate more in the initial position.
      (2) Alveolar sounds tend to concentrate more in the final position.
10. The distribution of consonants on the syllabic variable of stress is such that all consonants have the greater proportion of their occurrences in accented syllables.
11. The distribution of consonants in the four position/stress categories is such that 42.37% are in the initial position of accented syllables, 10.52% are in the initial position of unaccented syllables, 40.09% are in the final position of accented syllables, and 7.02% are in the final position of unaccented syllables.

Implications for Future Research

The present study has implications for future research in two major areas:

1. The present study described the frequency distributions of phonetic contexts, but made no attempt to explain the differences which exist. The question remains: Why do certain contexts of a phoneme occur more frequently than others? Following Zipf's (1965) lead for the phoneme, the "magnitude of complexity" of phonetic contexts may account for the differences which exist. The parameters of complexity of phonetic context will first have to be defined.
2. The findings of the present study and those of Griffith and Miner (1973a) provide a data base for any study using phonetic context as a variable. To date, most phonetic context research has been done in the area of functional articulation disorders. The results of the present study make phonetic context investigations in the areas of voice, stuttering, apraxia, and speech-sound discrimination feasible.

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