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A Phonetic Context Analysis of Nine Frequently Misarticulated Sounds

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A PHONETIC CONTEXT ANALYSIS

OF NINE FREQUENTLY MISARTICULATED SOUNDS

(TITLE)

BY

KATHERINE ANN LITTLE

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DEDICATION

This thesis was completed through the understanding and patience of my husband, Steve, and my two sons, Jason and Aaron. It is, in part, dedicated to them.

It is also dedicated to Mrs. Irene Bennet, a friend and fellow speech pathologist. I began my career under her excellent supervision. Her enthusiasm for her work and her skillful methods with her students have provided me with the motivation to increase my knowledge and my ability as a public school speech pathologist.

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CHAPTER ONE

INTRODUCTION

The importance of phonetic context to articulation learning is certainly one of the most important developments in speech pathology in recent years. Phonetic context is typically defined as those phonetic conditions that affect the production of a specific speech sound. It is widely accepted that articulatory performance is influenced by the sound combinations which precede and follow a specific sound. To the speech clinician phonetic context is invaluable in the diagnosis and treatment of articulation disorders.

The assessment of articulatory behavior should concentrate on the phonetic contexts which occur with the highest frequency. The clinician can then assess the speech behavior of an individual more accurately since the testing situation would more closely exemplify normal language usage. The purpose of articulation deep testing is to increase the probability of learning by identifying the sound combinations a child is most likely to learn. At this time most articulation tests do not take phonetic context sufficiently into consideration and are therefore deficient and limited in value.

Griffith and Miner (1973) found that nine commonly used articulation tests are not representative of the phonetic context distribution in speech for /r/. The sound /r/ is cited only as an example of the general failure of articulation tests to represent accurately phonetic context distributions for all sounds. The nine tests are: (1) Fisher-Logemann Test of Articulation Competence, (2) Predictive Screening Test of Articulation by Van Riper and Erickson, (3) McDonald Screening Test of Articulation, (4) McDonald Picture Version of the Deep Test of Articulation, (5) Hejna Developmental Speech Sound Test, (6) Templin-Darley Test of Articulation, (7) Goldman-Fristoe Test of Articulation, (8) Laradon Articulation Scale, and (9) Bryngleson-Glaspy Articulation Test. The tests each sample from 6 to 12 of the total 42 different phonetic contexts for /r/. This represents 14% to 29% of the total /r/ contexts. The tests vary in their representativeness for the most frequent phonetic contexts of the language.

The second important function of phonetic context is its value in treatment. Knowing the most frequent phonetic contexts (and the most frequently occurring words) simplifies the continuous decisions about the appropriateness of therapy materials. Stimulus words which the student is likely to produce correctly can be selected. Words can be chosen according to their frequency of occurrence and frequency of phonetic context. When efficiency is gained in therapy, the student will also be most likely to achieve success in his

everyday communication. This is true because therapy would have concentrated on the most frequently occurring contexts in normal speech.

Most recently Griffith and Miner (1973) have tied phonetic context to Zipf's Law. George Kingsley Zipf was interested in the various features of words, especially in their varying lengths. He made an extensive study of speech units of varying sizes and formulated a law (Law of Abbreviation) which states that word length bears an inverse relationship to its relative frequency (Zipf, 1935, p. 38). In other words, the shorter the word, the greater its frequency. Zipf's Law can be extended. Word lengths are rank ordered for frequency of usage. It follows that difficulty of phonetic contexts are also rank ordered for frequency of occurrence. Leonard and Ritterman (1971) found that inconsistencies of /s/ production in consonantal clusters appear to be related to the frequency with which these clusters occur. The more common contexts are more available for the child and are practiced and discriminated more often. Therefore, these contexts appear to become easier to produce as a result of frequency of occurrence. It is important then to know the frequency distribution of the phonetic contexts for the most frequently occurring words. The question now arises which word list should be used for making diagnostic decisions? The Thorndike-Lorge (1944) word list was used as the source for the 10,000 most common words. It has been shown in a previous paper (Griffith, Miner, 1973) that this

is the most logical listing of words to use. It is the result of an extensive study and it shows a high percentage of overlap with other lists that have been compiled. The Thorndike-Lorge study sampled 41 different sources which reflected over 4 million words. All of these words were ranked for frequency of usage. The first 10,000 of these words have conveniently been divided into five levels. Chart 1 illustrates this division.

CHART 1
THORNDIKE-LORGE LIST'S FIRST 10,000 WORDS

Level One	First 1000 words	Grade Levels 1 & 2
Level Two	Next 1500 words	Grade Levels 3 & 4
Level Three	Next 3200 words	Grade Levels 5 & 6
Level Four	Next 3200 words	Grade Levels 7 & 8
Level Five	Last 1100 words	Grade Levels 9 - 12

In an earlier study (Griffith, Miner, 1973) the first 1000 of the Thorndike-Lorge words have been analyzed for the phonetic contexts of the nine most frequently misarticulated sounds (/r, ɝ, ɚ, l, s, z, ʃ, tʃ, dʒ/). This list of nine speech sounds which are most often in error was compiled by a careful review of past research on the frequency of misarticulated phonemes and by applying their clinical insights based on experience. These nine sounds are the sounds clinicians deal with everyday in therapy, and therefore are the sounds about which clinicians need detailed information. The phonetic

context distributions of /r, s, l/ for the next 1500 words have also been analyzed (Dorn, 1973; Schneider, 1973).

Statement of Purpose

The purpose of the present study was to extend the phonetic context analysis for the nine most frequently misarticulated sounds through the 10,000 most common words. This study includes the results the previous studies have reported as well as the information compiled by this researcher. This paper provides one source from which to draw helpful and needed information for therapy.

Questions

Therefore, the following questions were posed at the beginning of this study:

1. What are the phonetic contexts for /r, ɝ, ɚ, l, s, z, ʃ, tʃ, dʒ/ at:
   a. Grade Levels 1 and 2 of the Thorndike-Lorge list
   b. Grade Levels 3 and 4 of the Thorndike-Lorge list
   c. Grade Levels 5 and 6 of the Thorndike-Lorge list
   d. Grade Levels 7 and 8 of the Thorndike-Lorge list
   e. Grade Levels 9 through 12 of the Thorndike-Lorge list
2. For each of the nine most frequently misarticulated phonemes is there a difference between the phonetic context rank orders at each grade level?

CHAPTER TWO

REVIEW OF THE LITERATURE

Phonetic Context

The importance of specific phonetic contexts can be determined by the most frequently occurring contexts in a child's language. To date few studies have analyzed the frequency of occurrence of the phonetic contexts of specific sounds.

Van Riper and Irwin (1958) alluded to a phonetic context approach to articulation therapy when they commented on Stetson's (1951) research on the syllable. Van Riper and Irwin felt that therapy should concentrate on the syllable and the sequential movement patterns rather than the "acoustic impressions that result from them..." They suggested that to carry out such a therapy program, intensive articulation testing was necessary. All contexts of the misarticulated sounds should be examined. Therapy, then, should begin with a syllable that was most nearly correct in the individual's speech.

Studies by Nelson (1945) and Hale (1948) on /s/ and the study by Buck (1948) on /r/ show that there is a systematic association between particular phonetic contexts and a greater frequency of correct production of these sounds.

They suggest that if what was commonly thought to be seemingly inconsistent behavior is really systematic and orderly, then it is certainly desirable and necessary to determine what factors bring about the systematic occurrence of correct production.

Spriestersbach and Curtis (1951) also found a systematic relationship between phoneme errors and the speech sound environment in which they occurred. They concluded that more intensive research should be done regarding phonetic context and articulation therapy.

Curtis and Hardy (1959) indicated that a thorough phoneme analysis of articulatory defective speech might be valuable in the understanding of and planning of a program for correcting speech. They felt a detailed analysis was necessary to determine the sounds misarticulated and to reveal the phonetic contexts which facilitate correct articulation in each case. Their data strongly indicates that phonetic context is an important factor in the articulatory process. They suggested that the assumption that therapy should begin with the isolated error sound must be re-examined and re-evaluated.

The first investigator to develop a deep test of articulation was McDonald (1964). He provided a clinical tool which utilized phonetic context to test and treat articulation disorders. This test assessed the production of a sound when it was preceded by 20 consonants and 3 vowels and followed by a single vowel. It also assessed the sound

when it was preceded by a single vowel and followed by 22 consonants and 4 vowels.

More recently in Building Basic Articulation Skills, Griffith and Miner (1973) present a complete phonetic context analysis of /r, ʒ, ɝ, l, s, z, ʃ, tʃ, dʒ/ as they occur in Level One (Grade Levels 1 & 2) of the Thorndike-Lorge word list. They considered the obtained phonetic contexts in terms of syllable position of the phoneme and the stress of the syllable in which the phoneme occurs. They suggest that in articulation therapy, it is best to utilize the phonetic context in which the error sound is most nearly correct. Knowing the appropriate context enables the clinician to select appropriate stimulus words. As a result of this research conducted by Griffith and Miner, a complete analysis for the above nine sounds of the first 1000 words of the Thorndike-Lorge word list is available and ready to be used in articulation therapy.

Dorn (1973) investigated the phonetic context distribution for /r/ among the Thorndike-Lorge Level Two words. He also compared the phonetic context distribution obtained by Griffith and Miner of the first 1000 words with the distribution for the next 1500 words. If Zipf's Law is true, then approximately the same percentages should hold for both levels of words.

Out of the Level Two 1500 words, 412 contain the /r/ phoneme. Approximately 54% of the 412 words are vowel combinations and 46% are blend combinations. These percentages

are the same as the percentages found by Griffith and Miner for the first 1000 words.

The percentage pairs for all of the phonetic context analyses of /r/ at Levels One and Two are very similar even though the number of words at each level differs. These results are in accordance with Zipf's Law and show that phonetic contexts do rank order themselves for frequency of occurrence.

Schneider's study (1973) conducted a phonetic context analysis for /s/ and /l/ at Level Two of the Thorndike-Lorge list. The phonetic context frequency of occurrence was analyzed in the same manner as that used by Griffith and Miner in their study of Level One words. The resulting rank order of phonetic contexts was compared to the data obtained by Griffith and Miner. No statistically significant differences in frequency of occurrence of phonetic contexts were found between Level One and Level Two for /s/ and /l/. Some contexts were added at Level Two but they were relatively low in frequency of occurrence. Most of these contexts were unaccented.

The phonetic context rank ordering between these two groups (Level One and Level Two) is very stable. This lends support to the hypothesis that similar phonetic context frequency of occurrences would be obtained for all levels beyond Level Two.

Schneider (1973) also conducted a study relating phonetic context to articulation ability. She used the most

frequently occurring contexts as found by Griffith and Miner (1973) and administered a deep test of /r/, /s/, and /l/ to defective /r/, /s/, and /l/ children respectively. Schneider found that for each phoneme, the phonetic contexts rank ordered themselves according to the percentage of children who articulated the sound correctly in the contexts. She also concluded that the interaction of syllabic position and stress influenced the rank orderings more than either of these factors when acting alone. She also concluded that phonetic context and articulatory ability are related. Particular contexts facilitate correct production while others inhibit correct production. This investigation by Schneider substantiates the value of deep tests of articulation.

The Syllable

The syllabic position of a sound refers to the location of the sound within the syllable. Consonants can release or arrest a syllable. Curtis and Hardy (1959) point out that the consonant's function within the syllable is more significant than that sound's position in the word.

Stetson (1951) has demonstrated that the syllable is the basic unit of speech as it is produced. Every syllable is composed of three parts: release, vowel shaping, and arrest. It is Stetson's point of view that in speech as it is produced, phonemes do not exist in and of themselves. They exist only as part of the syllable in which they occur.

All of the movement units of speech occur in each utterance whether it consists of one syllable or many. Therefore, the syllable is a valid unit to be analyzed for phonetic context.

Keenan (1961) also recommended that consonants be considered only in terms of their function in the syllable. He felt the classification as Initial, Medial, and Final was insufficient for consonants. "Medial" merely implies that the phoneme is not first or last in the word. Within its syllable a sound classified as "medial" may function in many different phonetic contexts, in different positions in the syllable, and in syllables with differing stress.

Griffith and Miner (1973) emphasize syllable position and syllable stress as important variables in sound production. Their data shows that linguistic stress reveals differences in words which the traditional initial, medial, and final categories do not give.

In summary, phonetic context is a relatively new development when related to articulation therapy. Many authorities have indicated the need to identify the particular phonetic contexts which occur most frequently and which facilitate correct articulation of specific sounds. However, few studies have actually analyzed the frequency of occurrence of the phonetic contexts of specific sounds.

The syllable was also shown to be a valid unit on which to base a phonetic context analysis. In connected speech phonemes exist only as part of the syllable in which they occur. All of the movement units which occur in speech occur in a syllable.

CHAPTER THREE

PROCEDURE

The procedure outlined in this chapter was followed for each of the nine most frequently misarticulated sounds (/r, ɝ, ɚ, l, s, z, ʃ, tʃ, dʒ/) at each of the following levels of the Thorndike-Lorge word list: Level Two (Grade levels 3 & 4), Level Three (Grade levels 5 & 6), Level Four (Grade levels 7 & 8), and Level Five (Grade levels 9 - 12). The results already obtained at Level One by Griffith and Miner (1973) and the results obtained for /r/, /s/, and /l/ at Level Two by Dorn (1973) and Schneider (1973) are included in the results of this study.

For this study, the syllable was considered as the unit of analysis for phonetic context. The phonetic context of a consonant functioning as a single was considered as consonant + vowel (CV) when it occurred at the beginning of the syllable. The phonetic context when the consonant single occurred at the end of the syllable was vowel + consonant (VC). The phonetic context of a consonant blend was considered to be the blend itself. The phonetic context of a vowel which occurred at the beginning of the syllable was considered to be the consonant which followed it. The phonetic context of a vowel which occurred at the end of a syllable was the

consonant which preceded it. A vowel which occurred in the medial position of a syllable had as its phonetic context the consonant which preceded it.

When a syllable received the primary stress of a word, the syllable was considered "accented". All other syllables were considered "unaccented". These are the only two degrees of stress recorded in this study.

Consonants, consonant blends, and vowels can either release a syllable or arrest a syllable. In this investigation, sounds which released a syllable were considered to be in the "initial" position. Sounds which arrested a syllable were considered to be in the "final" position. Therefore, each sound can hold one of four positions in a syllable. The positions are initial/accented (I/A), initial/unaccented (I/UA), final/accented (F/A), and final/unaccented (F/UA). Vowels can hold one of two additional positions, medial/accented (M/A) and medial/unaccented (M/UA).

Each word on the Thorndike-Lorge list which contained the specific sound being analyzed was identified. This investigator utilized the Griffith and Miner word lists (1973) as the direct source for the words. Each word was located in the Griffith and Miner lists and written in the middle of a 1½" x 2½" card. The sound being analyzed for the word was written in the upper right hand corner. The position of the sound in the syllable was written in the upper left hand corner. The grade level of the word was written beneath the notation for the position of the sound in the syllable.

Next, the phonetic context was written in the lower left hand corner. Kenyon and Knott (1955) was used to verify the phonetic spelling of words where there was doubt. The first pronunciation was always used. When the analysis of all words at all levels was completed, the cards obtained were sorted according to context and syllabic position and stress. Each level was kept separate. The cards obtained from sorting were counted and frequency of occurrences were recorded according to context and syllabic position and stress. Frequency of occurrence tables and rank order tables were constructed from this information. The rank orders for all nine sounds at all five levels of the Thorndike-Lorge word list were then compared for similarities and differences.

This study expanded systematically the previous studies by Griffith and Miner, Dorn, and Schneider. The following chart illustrates the information on phonetic analysis for the nine most frequently misarticulated sounds that was available before this study was completed. This study provides all of the information to complete the chart.

CHART 2
AVAILABLE PHONETIC CONTEXT INFORMATION
BEFORE THE PRESENT STUDY

Thorndike-Lorge List	Phonemes								
First 10,000 Words	r	ɝ	ɚ	l	s	z	ʃ	tʃ	dʒ
Level One	x	x	x	x	x	x	x	x	x
Level Two	x			x	x				
Level Three									
Level Four									
Level Five									

CHAPTER FOUR

RESULTS AND DISCUSSION

The phonetic contexts for /r, ɝ, ɚ, l, s, z, ʃ, tʃ, dʒ/ have been determined. The frequency of occurrence tables for these phonemes appear in the Appendix of this paper. All nine of the sounds analyzed, singles and blends, do not occur at each level of the Thorndike-Lorge word list in every syllabic position. The following two charts illustrate what sounds occur at each level, and what syllabic positions are present at each level.

CHART 3
MATRIX OF SINGLES' OCCURRENCE IN ALL FIVE LEVELS OF THE THORNDIKE-LORGE WORD LIST

Phoneme	Context	Level 1	Level 2	Level 3	Level 4	Level 5
r	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	-	+	+	+	+
ɝ	I/A	+	+	+	+	-
	I/UA	-	-	-	-	-
	F/A	+	+	+	+	+
	F/UA	-	-	+	-	+
	M/A	+	+	+	+	+
	M/UA	-	-	-	-	-
ɚ	I/A	-	-	-	-	-
	I/UA	-	+	-	+	+
	F/A	-	-	-	-	-
	F/UA	+	+	+	+	+
	M/A	-	-	-	-	-
	M/UA	+	+	+	+	+

CHART 3—Continued

Phoneme	Context	Level 1	Level 2	Level 3	Level 4	Level 5
l	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	+	+	+	+	+
s	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	+	+	+	+	+
z	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	+	+	+	+	+
ʃ	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	+	+	+	+	+
tʃ	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	-	+	-	+	+
dʒ	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	+	+	+	+	+

CHART 4

MATRIX OF BLENDS' OCCURRENCE IN ALL FIVE LEVELS OF THE THORNDIKE-LORGE WORD LIST

Phoneme	Context	Level 1	Level 2	Level 3	Level 4	Level 5
r	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	-	-	+	+	+
ɜ	I/A	-	-	-	-	-
	I/UA	-	-	-	-	-
	F/A	-	-	-	-	-
	F/UA	-	-	-	-	-
	M/A	-	-	-	-	-
	M/UA	-	-	-	-	-
ɚ	I/A	-	-	-	-	-
	I/UA	-	-	-	-	-
	F/A	-	-	-	-	-
	F/UA	-	-	-	-	-
	M/A	-	-	-	-	-
	M/UA	-	-	-	-	-

CHART 4—Continued

Phoneme	Context	Level 1	Level 2	Level 3	Level 4	Level 5
l	I/A	+	+	+	+	+
	I/UA	+	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	-	+	+	+	+
s	I/A	+	+	+	+	+
	I/UA	-	+	+	+	+
	F/A	+	+	+	+	+
	F/UA	+	+	+	+	+
z	I/A	-	-	-	-	-
	I/UA	-	-	-	-	-
	F/A	+	+	+	+	+
	F/UA	+	+	+	+	+
ʃ	I/A	-	+	+	+	+
	I/UA	-	-	-	-	-
	F/A	-	-	-	-	-
	F/UA	-	-	+	-	-
tʃ	I/A	-	-	-	-	-
	I/UA	-	-	-	-	-
	F/A	+	+	+	+	+
	F/UA	-	-	-	-	+
dʒ	I/A	-	-	-	-	-
	I/UA	-	-	-	-	-
	F/A	+	+	+	+	+
	F/UA	-	+	-	+	-

The following eight tables summarize the rank orders of the various phonetic context distributions of /r/ at all five levels of occurrence. When ranking two or more contexts which occur with equal frequency, the average of the ranks is assigned to each context.

TABLE 1.1
/r/ VOWEL COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	rɛ	1	re	1	rɛ	1	re	1	rɛ
2	ri	2	rɛ	2	re	2	rɛ	2	ro
3.5	re	3	rI	3	rI	3	rI	3.5	rI
3.5	raI	4.5	rɚ	4	rɚ	4	rɚ	3.5	re
5.5	rI	4.5	raI	5.5	ro	5	ri	5	rɚ
5.5	ro	6.5	ra	5.5	rʌ	6	rʌ	6	ru

TABLE 1.1—Continued

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
7	ru	6.5	ri	7	ri	7.5	ra	7	rʌ
9	ræ	8.5	ro	8	raI	7.5	raI	8	raI
9	rʌ	8.5	ru	9	ra	9	ru	9	ra
9	raU	10	rʌ	10	ru	10	ro	10	ri
11.5	ra			11	rɔI	11	rɔ	12	rU
11.5	rɔ			12	raU	12	raU	12	raU
								12	rɔI

TABLE 1.2
/r/ VOWEL COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	rI	1	rI	1	rI	1	rI	1	rI
2	rə	2	rə	2	rə	2	rə	2	rə
3	ro	3.5	rɛ	3	rɛ	3	ri	3	re
		3.5	ro	4	re	4.5	re	4	raI
		5.5	ræ	5.5	ri	4.5	rɛ	5.5	ri
		5.5	ru	5.5	raI	6	raI	5.5	rɛ
				7.5	ro	8	ræ	7.5	ro
				7.5	ru	8	ro	7.5	ru
						8	ru	9	ræ
								10	rɔI

TABLE 1.3
/r/ VOWEL COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	ɛr	1	ar	1	ɛr	1	or	1	Ir
2.5	Ir	2.5	ɛr	2	ar	2	ɛr	2	ar
2.5	ɔr	2.5	ɔr	3	or	3	ar	3	ɛr
4	ar	4	Ir	4.5	Ir	4	Ir	4	ɔr
5	or	5	ær	4.5	ɔr	5	ɔr	5	or
6	Ur	6	or	6	ær	6	ær	6	ær
7	ær	7	Ur	7	Ur	7	aIr	7.5	Ur
8	aIr	8	aIr	8	aIr	8	Ur	7.5	aIr
9	aUr	9	aUr	9	aUr	9	aUr	9	aUr

TABLE 1.4
/r/ VOWEL COMBINATIONS: F/UA

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
	1 ɛr	1 ɛr	1 ɚ	1 ɛr
	2 ɔr	2 ɚ	2 ɛr	2 ɚ
	3.5 Ir	3 ɔr	3 ɔr	3 or
	3.5 ɚ	4.5 ar	4 Ir	4 ar
———	6.5 ɝ	4.5 or	5 ar	5 Ir
	6.5 or	6.5 ɝ	6 or	6 ɔr
	6.5 Ur	6.5 aIr	7 aIr	7 Ur
	6.5 aIr	8.5 Ir	8.5 ɝ	
		8.5 Ur	8.5 aUr	

TABLE 1.5
/r/ BLEND COMBINATIONS: I/A

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
1 pr	1 pr	1 gr	1 str	1 pr
2 tr	2 tr	2 br	2 pr	2 tr
3 gr	3 kr	3 str	3 θr	3 fr
4 br	4.5 br	4 kr	4 skr	4 br
5 fr	4.5 fr	5 tr	5 spr	5.5 kr
6.5 dr	6 gr	6 fr	6 ʃr	5.5 gr
6.5 str	7 dr	7.5 dr		7 str
8 kr	8 str	7.5 θr		8.5 dr
9.5 θr	9 θr	9.5 skr		8.5 skr
9.5 spr	10 skr	9.5 ʃr		10.5 θr
	11 spr	11 spr		10.5 ʃr
				12 spr

TABLE 1.6
/r/ BLEND COMBINATIONS: I/UA

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
1.5 pr	1 pr	1 tr	1 pr	1 pr
1.5 tr	2 tr	2.5 br		2 tr
3 dr	3 gr	2.5 gr		3 kr
	4 fr	4 dr		4 dr
	5 kr	5 kr		5 gr
	7 dr	7 fr		6 br
	7 br	7 spr		7 skr
	7 str	7 skr		8 fr

TABLE 1.7
/r/ BLEND COMBINATIONS: F/A

Rank 1		Rank 2		Rank 3		Rank 4		Rank 5	
1	rt	1	rt	1	rt	1	rt	1.5	rt
2	rd	2	rk	2	rd	2	rs	1.5	rs
3	rm	3	rm	3.5	rk	4.5	rd	3.5	rm
5	rk	4.5	rd	3.5	rn	4.5	rk	3.5	rn
5	rs	4.5	rn	6	rtʃ	4.5	rm	5	rd
5	rdʒ	6	rtʃ	6	rdʒ	4.5	rn	6	rk
7.5	rɵ	7	rs	6	rz	8	rtʃ	8	rdʒ
7.5	rn	9.5	rf	10	rs	8	rdʒ	8	rdz
9	rtʃ	9.5	rl	10	rɵ	8	rv	8	rtʃt
		9.5	rlz	10	rm	12.5	rɵ		
		9.5	rmpɵ	10	rf	12.5	rf		
				10	rp	12.5	rst		
						12.5	rz		
						12.5	rnt		
						12.5	rl		

TABLE 1.8
/r/ BLEND COMBINATIONS: F/UA

Rank 1	Rank 2	Rank 3		Rank 4		Rank 5	
		1	rd	3	rt	1	rt
		2	rɵ	3	rd	2	rd
———	———	3	rt	3	rz	3	rdʒ
		5	rk	3	rɵ	4.5	rz
		5	rs	3	rm	4.5	rɵ
		5	rn				

Basically, the phonetic contexts for /r/ vowel combinations, initial/accented position (Table 1.1) are consistent among the five levels at the top of the ranks. /rɛ/, /re/, and /rI/ consistently appear at the top. The bottom ranks in Table 1.1 are not as consistent. However, referring to the frequency of occurrence table (Appendix, Table 10.1) for /r/ singles, initial/accented position shows that beyond rank 4 at all levels the frequency of occurrence for each context

is less than ten. Therefore, what seem to be fairly significant shifts in rank are not as great as they first appear.

Table 1.2 (I/UA) shows that /rI/ and /rə/ rank one and two at all levels. /ro/, /ru/, /rɚ/, and /rɔI/ all rank low at the levels where they occur. It should be noted that the number of contexts for /r/, initial/unaccented position increases with each level.

/ɛr/, /ar/, /or/, and /Ir/ rank high and /aIr/ and /aUr/ rank low at each level in Table 1.3 (F/A). Even the middle ranks in this table are consistent throughout the five levels.

Table 1.4 (F/UA) shows that at Level One /r/ does not occur in the final/unaccented position. The contexts /ɛr/, /ər/, and /ɔr/ rank high in the remaining four levels. /ɚr/, /Ur/, and /aIr/ rank low in each level where they occur. One shift in rank which occurs for /r/, final/unaccented position is with the context /Ir/. It ranks third, fourth and fifth at Levels Two, Four and Five respectively, but it ranks 8.5 at Level Three. The frequencies (Appendix, Table 10.4), however, are two at Level Two, one at Level Three, eight at Level Four, and four at Level Five. Therefore, the differences in rank are not significant when frequency of occurrence is considered.

Table 1.5 (I/A Blends) shows a relative amount of inconsistency between levels. /pr/ ranks high at Levels One, Two, Four, and Five, but it does not even occur at Level Three. /tr/ and /br/ rank high at Levels One, Two, Three, and Five, but do not occur at Level Four. /str/ ranks high at

Levels Three and Four, but low at Levels One, Two, and Five. /θr/ ranks high at Level Four, and low at all other levels.

Table 1.6 (1/UA Blends) shows that /pr/ ranks number one at all levels except Three, where it does not occur. /tr/ also ranks high at all levels except Four, where it does not occur. It should be noted that only three contexts of /r/ blends, initial/unaccented position occur at Level One and only one context occurs at Level Four.

/rt/ ranks number one at all levels in Table 1.7 (F/A Blends). /rd/ also ranks relatively high at all levels, but beyond these two contexts, there is considerable variation.

As Table 1.8 illustrates, few /r/ blend, final/unaccented position, contexts occur. The most frequently occurring context is /rt/ at Level Five, where it occurs five times. /rd/ which ranks number one at Level Three occurs four times. Each context at Level Four occurs one time.

Viewing Tables 1.1 through 1.4 shows that stress and syllabic position are important variables when considering the most frequently occurring contexts for /r/. Different phonetic contexts of /r/ occur most frequently for each of the four positions /r/ can hold in a syllable.

Tables 1.5 through 1.8 make it evident that accented /r/ blend combinations occur more frequently than unaccented /r/ blend combinations. /pr/ occurs most frequently for initial /r/ blend combinations, and /rt/ occurs most frequently for final /r/ blend combinations. The /r/ blend combinations are less consistent between levels than the /r/

vowel combinations. Since there are more possible blend combinations than vowel combinations, this does not seem to be an unexpected result.

The following six tables summarize the rank orders of the various phonetic context distributions of /ʃ/ at all five levels of occurrence. When ranking two or more contexts which occur with equal frequency, the average of the ranks is assigned to each context.

TABLE 2.1
/ʃ/ COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1.5	ʃ	1	ʃn	1	ʃə	1.5	ʃn		
1.5	ʃə	2.5	ʃl	2.5	ʃ	1.5	ʃə	———	
		2.5	ʃdʒ	2.5	ʃn	3.5	ʃdʒ		
						3.5	ʃv		

TABLE 2.2
/ʃ/ COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
———		———		1	ʃb	———		———	

TABLE 2.3
/ʃ/ COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	sʃ	1	pʃ	1	tʃ	1	tʃ	1.5	tʃ
2	dʒʃ	2	kʃ	2	sʃ	2.5	fʃ	1.5	bʃ
3	pʃ	3.5	fʃ	3	vʃ	2.5	vʃ	3	kʃ
5.5	fʃ	3.5	mʃ	4.5	fʃ	4	pʃ	6	pʃ
5.5	θʃ	5.5	sʃ	4.5	kʃ	5.5	bʃ	6	fʃ
5.5	hʃ	5.5	wʃ	8	pʃ	5.5	kʃ	6	sʃ
5.5	wʃ	7	tʃ	8	hʃ	7	sʃ	6	dʒʃ
		8	vʃ	8	lʃ	8	hʃ	6	mʃ

TABLE 2.3—Continued

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
		10	dʒ	8	mʃ	10.5	lʃ	10.5	θʃ
		10	bʃ	8	nʃ	10.5	mʃ	10.5	wʃ
		10	lʃ	13.5	θʃ	10.5	nʃ	10.5	vʃ
		13	θʃ	13.5	dʒ	10.5	zʃ	10.5	zʃ
		13	dʃ	13.5	wʃ	14	dʒ	14	hʃ
		13	jʃ	13.5	bʃ	14	wʃ	14	gʃ
				13.5	gʃ	14	hwʃ	14	ʃʃ
				13.5	ʃʃ				

TABLE 2.4
/ʃ/ COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
				1	tʃ			1	pʃ
				2.5	sʃ			3.5	tʃ
———		———		2.5	vʃ	———		3.5	bʃ
								3.5	fʃ
								3.5	wʃ

TABLE 2.5
/ʃ/ COMBINATIONS: M/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	wʃ	1.5	sʃ	1	sʃ	1	wʃ	1	vʃ
3	bʃ	1.5	zʃ	2	tʃ	3	bʃ	2	sʃ
3	tʃ	3	pʃ	4	wʃ	3	vʃ	3	bʃ
3	hʃ	7.5	nʃ	4	zʃ	3	pʃ	4	fʃ
7.5	fʃ	7.5	vʃ	4	kʃ	5	tʃ	7.5	gʃ
7.5	gʃ	7.5	kʃ	7	fʃ	11.5	fʃ	7.5	hʃ
7.5	sʃ	7.5	bʃ	7	lʃ	11.5	gʃ	7.5	wʃ
7.5	θʃ	7.5	tʃ	7	dʒ	11.5	sʃ	7.5	zʃ
7.5	lʃ	7.5	fʃ	11	bʃ	11.5	θʃ	7.5	dʃ
7.5	tʃʃ	7.5	hʃ	11	vʃ	11.5	hʃ	7.5	kʃ
		7.5	wʃ	11	pʃ	11.5	lʃ		
		12	θʃ	11	mʃ	11.5	tʃʃ		
		15	lʃ	11	jʃ	11.5	kʃ		
		15	dʃ			11.5	nʃ		
		15	hwʃ			11.5	dʒ		
		15	mʃ			11.5	mʃ		
		15	ʃʃ			11.5	hwʃ		

TABLE 2.6
/ʃ/ COMBINATIONS: M/UA

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
———	———	1 wʃ 2 vʃ	———	1 wʃ 2 bʃ 3 kʃ

Table 2.1 (I/A) shows that /ʃ/ in the initial/accented position is not a common occurrence at any level of the Thorndike-Lorge word list. It occurs in two contexts at Level One, three contexts at Levels Two and Three, four contexts at Level Four, and it does not even occur at Level Five. These contexts occur either once or twice (Appendix, Table 11.1), so no combination of /ʃ/ in the initial/accented position of a syllable is a frequently occurring context.

The occurrence of /ʃ/ in the initial/unaccented position of a syllable is definitely not significant as shown in Table 2.2 (I/UA). The only context is ʃb/ which occurs only once at Level Three. Since /ʃ/ is by definition accented, its occurrence in unaccented syllables should not be expected.

Table 2.3 (F/A) illustrates that after Level One many contexts of /ʃ/ occur. /pʃ/, /kʃ/, /fʃ/, /tʃ/, and /sʃ/ consistently occur at the upper ranks. There is considerable variance in the middle and lower ranks of this table. The frequency of occurrence table (Appendix, Table 11.3) shows that none of the contexts occur more than twelve times. Therefore, the difference between the upper and lower ranks is not as great as it first seems.

In Table 2.4 (F/UA) the lack of contexts for /ɜ/ is obvious. Again, /ɜ/ should not be expected to occur frequently in an unaccented syllable.

/ɜ/ combinations in the medial/accented position are numerous as indicated by Table 2.5 (M/A). The most frequently occurring context, however, is /vɜ/ which occurs seven times at Level Five (Appendix, Table 11.5). Therefore, the largest difference between the top rank and the bottom rank is six.

Table 2.6 (M/UA) illustrates that /ɜ/ does not occur frequently in an unaccented syllable, as would be expected since /ɜ/ is a stressed vocalic sound.

When comparing Tables 2.1 through 2.6, the most obvious characteristic is that /ɜ/ does not often occur in an unaccented syllable or in the initial/accented position. Tables 2.3 (F/A) and 2.5 (M/A) are characterized by a great number of contexts, none of which occur with great frequency. There is little difference between the top and the bottom rank orders. Therefore, when selecting phonetic contexts for /ɜ/, any phonetic context which occurs would be appropriate.

The following three tables illustrate the rank orders for the phonetic contexts of /ə/ at all five levels of the Thorndike-Lorge list. /ɜ/ does not occur in the initial/accented, the final/accented, or the medial/accented positions. Since /ə/ is by definition unaccented, this result is not unexpected.

TABLE 3.1
/ə/ COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
———		1	ə d	———		1	ə t	1	ə d

TABLE 3.2
/ə/ COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	tə	1	tə	1	tə	1	tə	1	tə
2	ðə	2	və	2	də	2.5	də	2	pə
3	və	3	də	3	və	2.5	və	3	də
4	də	4	pə	4	ə	4	lə	4	və
6	pə	5	tʃə	5	lə	5	pə	5	lə
6	bə	6	ə	7	mə	6	nə	6	nə
6	fə	7	lə	7	nə	7	fə	7	ə
9	ə	8	bə	7	tʃə	8	kə	8	sə
9	nə	9.5	fə	9	pə	9.5	bə	10	mə
9	tʃə	9.5	ðə	11	fə	9.5	sə	10	tʃə
12	gə	12	nə	11	sə	12	ə	10	kə
12	sə	12	dʒə	11	ðə	12	tʃə	12	bə
12	mə	12	kə	13.5	gə	12	zə	13.5	gə
14.5	dʒə	14	gə	13.5	kə	15	gə	13.5	dʒə
14.5	ʒə	15	mə	15	zə	15	ðə	15.5	fə
17	θə	16	jə	17	bə	15	dʒə	15.5	ðə
17	lə	17.5	ʃə	17	dʒə	18	mə	17.5	θə
17	hə	17.5	sə	17	ʒə	18	ʒə	17.5	ʃə
		20	θə	19.5	jə	18	ʃə	20	ʒə
		20	ʒə	19.5	ʃə	20	jə	20	jə
		20	zə			21	θə	20	zə

TABLE 3.3
/ə/ COMBINATIONS: M/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	wə	1	tə	1	wə	1	wə	1	wə
3.5	də	2	wə	2	bə	2	fə	2	tə
3.5	və	4	ðə	3	və	3.5	zə	3	də
3.5	kə	4	bə	5.5	hə	3.5	tə	5	bə
3.5	fə	4	tʃə	5.5	zə	6.5	tʃə	5	fə
		9	dʒə	5.5	fə	6.5	jə	5	və
		9	zə	5.5	tə	6.5	bə	7	kə
		9	sə			6.5	pə		
		9	mə						
		9	jə						
		9	fə						
		9	pə						

/ɚ/ occurs in two contexts, /ɚd/ and /ɚt/, in Table 3.1 (I/UA). Each of these contexts occurs once at the level in which it is ranked (Appendix, Table 12.1).

Table 3.2 (F/UA) illustrates that /ɚ/ occurs in many contexts in the final/unaccented position of a syllable. /tɚ/ ranks number one at all levels. /dɚ/ and /vɚ/ also consistently rank high at all levels. One shift which occurs is for /ðɚ/ which ranks number two at Level One and below 9.5 at all other levels. Another shift is for /lɚ/. It ranks seventeenth at Level One and seven or above at all other levels. The middle and bottom ranks for /ɚ/ in the final/unaccented position are not as consistent as the upper ranks.

Table 3.3 (M/UA) shows that Level Two contains more contexts of /ɚ/ than any other level. /wɚ/ ranks consistently high at all levels, but beyond this one context, the rank orders are not as consistent. Many of the contexts do not occur at all levels.

In comparing Tables 3.1 through 3.3, it becomes obvious that /ɚ/ occurs in a great number of phonetic contexts. Syllabic position and stress are important considerations when choosing /ɚ/ words which are representative of the total distribution of /ɚ/ words in the English language. Words which contain /ɚ/ in the final/unaccented position of a syllable are certainly more representative of the distribution of /ɚ/ words in our language than are words which contain /ɚ/ in the initial/unaccented position.

The next eight tables illustrate the rank orders of the phonetic contexts for /l/, singles and blends, at all five levels of the Thorndike-Lorge word list.

TABLE 4.1
/l/ VOWEL COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	lɛ	1	lI	1	lI	1	laI	1	lɛ
2	lɔ	2.5	laI	2	lɚ	2.5	lI	2	lI
3	le	2.5	lʌ	3	lɛ	2.5	lɚ	3	le
4.5	lI	4	lɛ	4.5	lɔ	4.5	la	5	li
4.5	laI	5.5	li	4.5	laI	4.5	lu	5	lɚ
6.5	li	5.5	lɚ	6	le	6	lɛ	5	laI
6.5	lo	8	le	7	lu	7	lo	7	lu
8	lɚ	8	la	8.5	li	9.5	li	8	lo
9.5	la	8	lu	8.5	la	9.5	le	9.5	la
9.5	lʌ	10	lɔ	10.5	lo	9.5	lɔ	9.5	lU
12.5	lU	11	lo	10.5	lə	9.5	lʌ	11.5	lɔ
12.5	lu	12	lʃ	12	lʃ	12	lu	11.5	lʌ
12.5	laU			14	lU	13	lɔI		
12.5	lʃ			14	laU	14.5	laU		
				14	lɔI	14.5	lə		

TABLE 4.2
/l/ VOWEL COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	lI	1	lI	1	lI	1	lI	1	lI
2	lə	2	lə	2	lə	2	lə	2	lə
3	laI	3	laI	3.5	le	3	lʃ	3	lʃ
		4.5	lo	3.5	lʃ	4	lɛ	4	le
		4.5	lʃ	5	lo	6	lɚ	5	laI
		6	lu	7	lɛ	6	lɔ	7	lɛ
				7	lɚ	6	laI	7	lɚ
				7	lɔ	8.5	lU	7	lɔ
				9.5	li	8.5	lu	10	la
				9.5	laI	11.5	li	10	lo
						11.5	le	10	lu
						11.5	la		
						11.5	lo		

TABLE 4.3
/l/ VOWEL COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	Il	1	ɛl	1	Il	1	Il	1	Il
2	ɔl	2	Il	2	ɛl	2	ɛl	2	ɛl
3	ol	3	al	3	æl	3	æl	3	æl
4	ɛl	4	æl	4	al	4	al	4	al
5.5	al	5	el	5.5	el	5	ɔl	5.5	ɔl
5.5	ul	7	il	5.5	ɔl	6.5	el	5.5	ʌl
8	el	7	aIl	7	ol	6.5	ʌl	7	il
8	æl	7	ul	8.5	il	8	ul	8	el
8	aIl	9	ol	8.5	ʌl	9	ol	9	ol
11	il	10	ɔl	10	aIl	10	Ul	10	ul
11	Ul	11.5	Ul	11	Ul	12	il	11	aIl
11	ɔIl	11.5	ʌl	12	ɔIl	12	aIl	13	Ul
13.5	ʃl	13.5	ʃl	14	ul	12	ɔIl	13	aUl
13.5	ʌl	13.5	aUl	14	aUl	14	ʃl	13	ɔIl
		15	ɔIl	14	ʃl	15	aUl		

TABLE 4.4
/l/ VOWEL COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	əl	1	əl	1	əl	1	əl	1	əl
2	ɔl	2	Il	2	al	4	Il	2	Il
		3	ʌl	3.5	Il	4	el	3	æl
		5.5	il	3.5	ɔl	4	ɛl	4	ɨ
		5.5	æl	6	ɛl	4	æl	6	ɔl
		5.5	aIl	6	æl	4	ɔl	6	ol
		5.5	ɔl	6	aIl	7	ul	6	aIl
				9	el	9.5	al	9	el
				9	ol	9.5	ol	9	ɛl
				9	Ul	9.5	aIl	9	ɔIl
						9.5	ɨ		

TABLE 4.5
/l/ BLEND COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	kl	1	pl	1	pl	1	pl	1	kl
2.5	bl	2	sl	2	kl	2	sl	2	bl
2.5	fl	3	bl	3	fl	3	bl	3	fl
4	gl	4	spl	4	sl	4	spl	4	pl
6	pl	5	skl	5	gl	5	skl	5	sl
6	sl			6	spl			6	gl
6	spl			7	skl			7	spl

TABLE 4.6
/l/ BLEND COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	gl	1	pl	1	bl	1	pl	1	pl
2	bl	2	spl	2	kl	2	spl	2	bl
				3	gl			3	kl
								4	fl

TABLE 4.7
/l/ BLEND COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	ld	1	lt	1	ld	1	lt	1.5	lt
2	lf	2	ld	2	lt	2	ld	1.5	ld
3	lt	3	lf	3.5	lp	3	lf	3.5	lv
6.5	lp	4.5	lv	3.5	lz	4.5	lv	3.5	lz
6.5	lk	4.5	lm	6.5	lk	4.5	lm	6	lp
6.5	lv	6.5	lk	6.5	lf	6.5	lk	6	lθ
6.5	lvz	6.5	ls	6.5	ls	6.5	ls	6	ldʒ
6.5	ls	9.5	lp	6.5	lm	9	lp		
6.5	lθ	9.5	lvz	9.5	lvz	9	lvz		
		9.5	lθ	9.5	lb	9	lθ		
		9.5	rl						

TABLE 4.8
/l/ BLEND COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
		2	lt	2	lt	2	lt	1	ld
———		2	ld	2	ld	2	ld	2	lf
		2	ls	2	lθ	2	ls	3.5	lt
								3.5	gl

In Table 4.1 (I/A), /lI/, /laʊ/, /lɛ/, /laI/ consistently rank high and /lU/, /laU/, and /lʒ/ consistently rank low at the levels in which they occur. /lɔ/, however, ranks high at Levels One and Three, but it ranks low at Levels Two, Four, and Five.

Table 4.2 (I/UA) is very consistent with /lI/ and /lə/ ranking numbers one and two at all levels, and /la/, /lu/, and /li/ ranking low at all levels where they occur. It should be noted that the number of phonetic contexts for /l/ in the initial/unaccented position increases as the level increases. Another thing which should be pointed out is that at Levels Three, Four, and Five, the frequency for /lI/ is over one hundred. The next most frequently occurring context is /lə/, which occurs less than thirty-three times at each level (Appendix, Table 13.2). Therefore, there is a considerable difference between rank number one and rank number two at these levels for /l/ in the initial/unaccented position.

Table 4.3 (F/A) is basically consistent. /Il/ and /ɛl/ rank high at all levels and /ɝl/, /aUl/, /Ul/, and /ɔIl/ rank low at all levels where they occur.

The phonetic context /əl/ ranks number one at all levels for /l/ in the final/unaccented position as shown in Table 4.4. The number of contexts increases considerably after Level One.

Table 4.5 (I/A Blends) is not totally consistent. /pl/ ranks high at Levels Two, Three, and Four, and /kl/ ranks high at Levels One, Three, and Five. At the bottom of the rank orders /spl/ and /skl/ are consistently low. The number of contexts for /l/ is small, so this probably accounts for the lack of consistency.

As illustrated in Table 4.6 (I/UA Blends), /l/ occurs in very few blend combinations in the initial/unaccented position of a syllable. The most frequently occurring context at any level is /pl/ at Level Five, which occurs seven times (Appendix, Table 13.6).

Table 4.7 (F/A Blends) shows that /ld/ and /lt/ rank high at all levels. The middle and bottom ranks are not as consistent. The frequency of occurrence for all phonetic contexts of /l/ blends in the final/accented position is thirteen or less, so the difference between the top and bottom ranks is not great (Appendix, Table 13.7).

/l/ does not occur in many blend combinations in the final/unaccented position as illustrated by Table 4.8. No contexts occur at Level One, three contexts occur at Levels Two, Three, and Four, and four contexts occur at Level Five.

In comparing Tables 4.1 through 4.4, it becomes apparent that stress and syllabic position are important considerations when choosing the most frequently occurring phonetic contexts for /l/ singles. For example, the frequently occurring context of /lə/ would be eliminated if stress was not considered. Therefore, polysyllabic words must be used so that all variations of stress are considered.

Tables 4.5 through 4.8 show that the rank orders for /l/ blend combinations are not as consistent as the rank orders for /l/ singles at all five levels. Stress is an important consideration for /l/ blend combinations, since more contexts occur in accented syllables than in unaccented

syllables. Monosyllabic words, therefore, would be appropriate to use for /l/ blend combinations.

The following eight tables summarize the rank orders of the various phonetic context distributions for /s/ at all five levels of occurrence.

TABLE 5.1
/s/ VOWEL COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	sɛ	1	sɛ	1	sɛ	1	sI	1.5	sɛ
2	sI	2	sI	2.5	sI	2	sɛ	1.5	sI
3	sʌ	3	sʌ	2.5	si	3	si	3	si
4.5	si	4	sɹ	4	sʌ	4	sʌ	4	sɹ
4.5	saI	5	se	5	sʃ	5	sɹ	5	sʌ
6	sʃ	6.5	sʃ	6	sɹ	6.5	saI	6.5	se
7.5	se	6.5	so	8	se	6.5	sa	6.5	saI
7.5	sɔ	8	si	8	so	8	se	9	sa
9	so	9	saI	8	saI	9.5	sɔ	9	sɔ
10.5	su	10.5	su	10	sa	9.5	sʃ	9	sʃ
10.5	saU	10.5	sɔ	11	su	11	su	11	so
12.5	sɹ	12.5	sa	12	saU	12	so	12	su
12.5	sɔI	12.5	sj	13	sɔ			13	sU

TABLE 5.2
/s/ VOWEL COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	sə	1	sI	1	sI	1	sə	1	sI
2	sʃ	2.5	sə	2	sə	2	sI	2	sə
3.5	sɛ	2.5	sn̩	3	sn̩	3	sn̩	3	saI
3.5	so	4	sɛ	4	sɛ	4	sl̩	4	sn̩
		5	sl̩	5	saI	5	sʃ	5	sɛ
		6.5	sɹ	6	sʃ	6	saI	6	sɹ
		6.5	so	7	su	7	sɛ	7	sʃ
		8	si	8	sl̩	8	se	8	su
				10.5	se	10.5	so	9	sl̩
				10.5	sɹ	10.5	sU	10	saU
				10.5	so	10.5	su	12.5	si
				10.5	saU	10.5	sʌ	12.5	se
						14	si	12.5	so
						14	sɔ	12.5	sʌ
						14	saU		

TABLE 5.3
/s/ VOWEL COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	Is	1	Is	1	ɛs	1	ɛs	1	ɛs
2	ɛs	2	æs	2	Is	2	æs	2	Is
3.5	es	3	ɛs	3	æs	3	Is	3	æs
3.5	æs	4	as	4	ʌs	4	ʌs	4.5	ʌs
6	is	5	ʌs	5	as	5	as	4.5	as
6	ɔs	6.5	ɔs	6	es	6	es	6	is
6	aIs	6.5	aIs	7	aIs	7	ɔs	7.5	ɔs
8	ʌs	9	is	8.5	is	9.5	is	7.5	aIs
11	as	9	es	8.5	us	9.5	us	9.5	us
11	os	9	ʃs	10	os	9.5	aIs	9.5	ʃs
11	us	11	us	11	ʃs	9.5	aUs	11.5	os
11	aUs	12.5	aUs	12.5	aUs	12	ʃs	11.5	aUs
11	ɔIs	12.5	ɔIs	12.5	ɔIs	13.5	os	13.5	Us
				14.5	ɔs	13.5	ɔIs	13.5	ɔIs
				14.5	Us				

TABLE 5.4
/s/ VOWEL COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	Is	1	Is	1	Is	1	Is	1	Is
2	ɚs	2	ɚs	2	ɚs	2	ɚs	2	ɚs
		3	ɛs	3	ɛs	3	ɛs	3	ɛs
		4	aIs	5	æs	4	æs	4	æs
		6.5	æs	5	ɝs	6.5	es	5	es
		6.5	as	5	n̩s	6.5	as	6	as
		6.5	aUs	8.5	es	6.5	aUs	8	us
		6.5	ɝs	8.5	ɔs	6.5	n̩s	8	aUs
				8.5	aIs	10	us	8	n̩s
				8.5	aUs	10	is		
						10	ɔs		

TABLE 5.5
/s/ BLEND COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	st	1	st	1	st	1	st	1	st
2	sp	2	str	2	sp	2	str	2	sp
3	str	3	sl	3	str	3	sl	3.5	sk
4	sk	4	sk	4	sk	4	sk	3.5	str
5	sm	5	sw	5	sn	5	sw	5	sl
6	spr	6	skr	6	skr	6	skr	6	skr

TABLE 5.5—Continued

Rank 1		Rank 2		Rank 3		Rank 4		Rank 5	
9	spl	7	sm	7.5	spr	7	sm	7	sm
9	skw	8	spl	7.5	sm	8	spl	8	sw
9	sn	9	sn	9	spl	9.5	spr	9.5	skw
9	sl	10	skw	10	skl	9.5	sn	9.5	sn
9	sw	11	skl			11	skw	11.5	spl
						12	skl	11.5	spr

TABLE 5.6
/s/ BLEND COMBINATIONS: I/UA

Rank 1		Rank 2		Rank 3		Rank 4		Rank 5	
		1	st	1	st	1	st	1	st
		2	sp	2	sp	2	sp	2.5	skr
———		3	spl	3	sk	3	spl	2.5	sp
				5	skr			4	sk
				5	sm				
				5	spr				

TABLE 5.7
/s/ BLEND COMBINATIONS: F/A

Rank 1		Rank 2		Rank 3		Rank 4		Rank 5	
1	st	1	st	1	st	1	st	1	st
2	ns	2	ns	2	ks	2	ns	2	ns
3	ts	3	rs	3	sk	3	rs	3	rs
4	rs	4.5	sk	6	nst	4.5	sk	4.5	sk
5	ks	4.5	sp	6	ls	4.5	sp	4.5	ks
7.5	sk	6	ls	6	kst	6	ls	6	ts
7.5	nst	7	rst	6	rs	7	rst	7	sp
7.5	ls			6	sp				
7.5	ps								
10	kst								

TABLE 5.8
/s/ BLEND COMBINATIONS: F/UA

Rank 1		Rank 2		Rank 3		Rank 4		Rank 5	
1	ns	1	ns	1	st	1	ns	1	ns
2	st	2	st	2	ks	2	st	2	st

TABLE 5.8—Continued

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
		3.5 rs 3.5 ns	3 ls	3 ks 5.5 ps 5.5 kst 5.5 sk 5.5 nst

Basically, the rank orders of phonetic contexts for /s/ vowel combinations, initial/accented position (Table 5.1), are consistent among the five levels. /sɛ/, /sI/, and /sʌ/ appear at the top and /su/, /so/, and /sɔ/ rank toward the bottom. Several of the phonetic contexts which appear at the bottom of one level do not even occur at another level so the consistency of their low ranks holds. One shift which does occur in this table is for the context /sɚ/. It ranks 12.5 at Level One, 4 at Level Two, 6 at Level Three, 5 at Level Four, and 4 at Level Five. When looking at the frequency of occurrence of this context, the shift is not as great as it first appears. /sɚ/ occurs once at Level One, ten times at Level Two, ten times at Level Three, ten times at Level Four, and fourteen times at Level Five (Appendix, Table 14.1).

Table 5.2 (I/UA) shows that /sI/ and /sə/ rank high, except at Level One where /sI/ does not occur. /so/ ranks low at all levels and /si/, /saU/, /sʌ/, and /sɔ/ rank low at the levels where they occur. It should be noted that as the level increases, the number of /s/ contexts increases considerably.

/Is/, /ɛs/, and /æs/ consistently rank high and /ɔIs/ and /aUs/ consistently rank low in Table 5.3 (F/A). /es/ ranks relatively high at Levels One, Three, and Four. It is ninth at Level Two and does not occur at Level Five.

Table 5.4 (F/UA) shows that /Is/ and /əs/ occur most frequently at all levels. Here, as in /s/ initial/unaccented syllables, the number of contexts increases as the level increases.

In Table 5.5 (I/A Blends) /st/, /str/, and /sk/ are very consistent in ranking high at all levels. /sp/ is high at Levels One, Three, and Five, but it does not occur at Levels Two and Four. Beyond the upper ranks there is a lot of variation. For example, /sl/ ranks ninth at Level One, third at Levels Two and Four, fifth at Level Five, and it doesn't occur at Level Three.

Table 5.6 shows that no /s/ blend combination in the initial/unaccented position occur at Level One and that relatively few contexts occur at the other levels. /st/ and /sp/ rank one and two at Levels Two through Five, but all of the occurring contexts rank five or lower.

/st/ and /ns/ are consistently one and two in Table 5.7 (F/A Blends) except that /ns/ does not occur at Level Three. /ns/ and /st/ are also the most frequently occurring contexts in the final/unaccented position (Table 5.8).

From looking at Tables 5.1 through 5.4, it becomes apparent that the variable of stress is an important consideration when determining the most frequently occurring contexts

for the given sound /s/. Polysyllabic words must be used so that all the variations of stress are used. For example, if stress is not considered and only monosyllabic words are used, the frequently occurring context of /əs/ would be eliminated.

Tables 5.5 through 5.8 make it evident that accented /s/ blend combinations occur more frequently than unaccented /s/ blend combinations. /st/ is the most frequently occurring context of all /s/ blend combinations in all positions. The blend combination rank orders are not as consistent as the vowel combination rank orders in the middle and bottom ranks. Since there are many more possible blend combinations than vowel combinations, this does not seem to be an unexpected result.

The following six tables summarize the rank orders of the various phonetic context distributions for /z/ at all five levels of occurrence. /z/ does not occur in initial/accented or initial/unaccented blend combinations.

TABLE 6.1
/z/ VOWEL COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
2.5	zI	2	zI	1	zI	1.5	zI	1	zɝ
2.5	zɑ	2	zɛ	2.5	zɛ	1.5	za	3	zɛ
2.5	zaI	2	zɝ	2.5	zɝ	4	ze	3	zaI
2.5	zʌ	4	zaI	5	zi	4	zɛ	3	zʌ
		5.5	zi	5	zɑ	4	zɝ	6	zi
		5.5	zɑ	5	zaI	7.5	zɑ	6	zI
		7.5	za	8	zɔ	7.5	zɔ	6	zu
		7.5	zɔ	8	zo	7.5	zaI	9.5	ze
		10.5	ze	8	zu	7.5	zaU	9.5	zɑ
		10.5	zo					9.5	za
		10.5	zU					9.5	zo
		10.5	zu						

TABLE 6.2
/z/ VOWEL COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	zə	1	zI	1	zI	1	zI	2	zi
2	zI	2.5	zə	2	zə	2	zɻ	2	zɚ
		2.5	zɻ	3.5	zaI	3	zə	2	zə
		4	zɚ	3.5	zɻ	4.5	zɚ	4.5	za
		5.5	zɹ	6	zɛ	4.5	zl̩	4.5	zɻ
		5.5	zl̩	6	zɚ	6.5	zɹ		
				6	zl̩	6.5	zo		

TABLE 6.3
/z/ VOWEL COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1.5	Iz	1	oz	1	oz	1	Iz	1	aIz
1.5	uz	2	Iz	2.5	Iz	2.5	oz	2	Iz
3	oz	3	iz	2.5	aIz	2.5	uz	4	ez
5	iz	4.5	uz	4	ez	4	ɛz	4	ɹz
5	aIz	4.5	aIz	5.5	ɛz	5	iz	4	oz
5	ʌz	6	ez	5.5	uz	6.5	ez	6	az
7	ɛz	7	ɛz	7	iz	6.5	aIz	8.5	iz
8.5	ɹz	8	ʌz	9.5	ɹz	8.5	az	8.5	uz
8.5	ɔz	10	az	9.5	az	8.5	ʌz	8.5	aUz
10	ez	10	aUz	9.5	ɔIz	11	ɹz	8.5	ʌz
		10	ɚz	9.5	ʌz	11	ɔz		
		13.5	ɹz	12	ɔz	11	ɔIz		
		13.5	ɔz						
		13.5	Uz						
		13.5	ɔIz						

TABLE 6.4
/z/ VOWEL COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	aIz	1	aIz	1	aIz	1	aIz	1	aIz
2.5	Iz	2	Iz	2	Iz	2	Iz	2	Iz
2.5	ez	3.5	ɛz	3	ɛz	3.5	iz	3.5	iz
		3.5	ɚz	4	iz	3.5	ɛz	3.5	ez
		6	iz	5.5	ez	6	oz	5.5	ɹz
		6	ɹz	5.5	ɔz	6	uz	5.5	ɚz
		6	uz			6	ɻz		
						9	ɹz		
						9	ɚz		
						9	ɔz		

TABLE 6.5
/z/ BLEND COMBINATIONS: F/A

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
1 lvz	1.5 nz	1.5 rz	1.5 nz	2 mz
	1.5 rz	1.5 lz	1.5 rz	2 zd
	3.5 lvz	3 nz	3.5 lvz	2 lz
	3.5 mz	4.5 lvz	3.5 mz	4.5 bz
		4.5 zd		4.5 rdz

TABLE 6.6
/z/ BLEND COMBINATIONS: F/UA

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
1 mz	1.5 zd	1.5 mz	1.5 zd	1 nz
	1.5 rz	1.5 nz	1.5 rz	2 rdz
				3.5 mz
				3.5 rz

To understand the meaning of the rank orders for /z/ in the initial/accented position (Table 6.1), it is important to consider the frequencies of the phonetic contexts for each level (Appendix, Table 15.1). At Level One, all of the contexts occur once. At Level Two, the most frequent contexts occur six times, and the least frequent contexts occur once. At Level Three, the most frequent context occurs five times, and the least frequent contexts occur once. At Level Four, the different frequencies are three for the most frequent contexts and once for the least frequent contexts. At Level Five, the most frequent context occurs four times, and the least frequent contexts occur once. All of the contexts for /z/ in the initial/accented position occur with almost the same frequency. Therefore, all of the contexts would be

fairly representative of the occurrence of /z/ words in the English language.

Table 6.2 (I/UA) shows that /zə/ ranks high at all levels. /zɪ/ ranks high at Levels One through Four, but it does not occur at Level Five. No context for /z/ initial/ unaccented position occurs more than ten times at any level (Appendix, Table 15.2).

/z/ occurs in many contexts in the final/accented position (Table 6.3). /Iz/ and /oz/ consistently rank high at all levels of occurrence. The frequencies of the contexts are again important (Appendix, Table 15.3). None of the contexts occur more than thirteen times. Frequencies in the middle and bottom ranks are especially close, so what appear to be shifts in rank orders are not significant changes.

The contexts /aIz/ and /Iz/ rank number one and two, respectively, at all levels of occurrence for /z/ in the final/unaccented position (Table 6.4). /z/ occurs in this position in fewer contexts at Level One than at any other level.

/z/ does not occur in blend combinations in the initial/ accented or the initial/unaccented positions. It does not occur in many contexts or with much frequency in blend combinations in the final/accented (Table 6.5) or the final/ unaccented (Table 6.6) positions. All contexts in the final/ accented position rank relatively the same, since the most contexts at any level are five, and the most frequent contexts occur three times (Appendix, Table 15.5). The contexts

for /z/ blends in the final/unaccented position also rank approximately the same. /nz/, which occurs four times at Level Five, and /rdz/, which occurs two times at Level Five, are the only contexts at any level which occur more than once (Appendix, Table 15.6).

In comparing Tables 6.1 through 6.4, it becomes apparent that /z/ singles occur in many contexts. When consulting the Appendix of this paper, Tables 15.1 through 15.4, it also becomes apparent that no context occurs with a great amount of frequency. When considering all contexts for /z/ singles at all levels, the most frequent context is /oz/ at Level Two in the final/accented position which occurs thirteen times.

When comparing /z/ blend combinations (Tables 6.5 - 6.6), the small number of /z/ contexts is the most noticeable fact. Considering blend combinations for /z/ would not be a significant factor in choosing /z/ words which would be representative of our language.

The next six tables show the rank orders for the various phonetic contexts of /ʃ/ at all five levels of occurrence. /ʃ/ does not occur in blend combinations in the initial/unaccented or the final/accented positions.

TABLE 7.1
/ʃ/ VOWEL COMBINATIONS: I/A

Rank 1		Rank 2		Rank 3		Rank 4		Rank 5	
1	ʃo	1	ʃi	1	ʃʌ	1	ʃɔ	1	ʃe
2	ʃU	2	ʃɛ	2.5	ʃI	2	ʃI	2.5	ʃI
4	ʃi	3.5	ʃe	2.5	ʃU	3	ʃæ	2.5	ʃa
4	ʃe	3.5	ʃæ	4	ʃæ	4.5	ʃɛ	4	ʃæ

TABLE 7.1—Continued

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
4	ʃa	6	ʃI	5.5	ʃe	4.5	ʃo	7.5	ʃʌ
8	ʃI	6	ʃa	5.5	ʃɛ	8.5	ʃi	7.5	ʃi
8	ʃɛ	6	ʃo	8.5	ʃi	8.5	ʃe	7.5	ʃɛ
8	ʃæ	8	ʃaI	8.5	ʃa	8.5	ʃa	7.5	ʃo
8	ʃu	11	ʃɔ	8.5	ʃu	8.5	ʃU	7.5	ʃaI
8	ʃaU	11	ʃu	8.5	ʃɝ	8.5	ʃaI	7.5	ʃɝ
		11	ʃaU			8.5	ʃʌ		
		11	ʃɝ						
		11	ʃʌ						

TABLE 7.2
/ʃ/ VOWEL COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	ʃə	1	ʃə	1	ʃə	1	ʃə	1	ʃə
		2	ʃI	2	ʃI	2	ʃI	2	ʃI
		3	ʃaI	3.5	ʃo	3	ʃɝ	3.5	ʃæ
				3.5	ʃU	4.5	ʃa	3.5	ʃu
						4.5	ʃo	5.5	ʃɛ
								5.5	ʃU

TABLE 7.3
/ʃ/ VOWEL COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	Iʃ	1	Iʃ	1	Iʃ	1	Iʃ	1	Iʃ
2	ɛʃ	3	ɛʃ	2	ɛʃ	2.5	ɛʃ	2.5	aʃ
3	aʃ	3	æʃ	3	æʃ	2.5	æʃ	2.5	Uʃ
4.5	æʃ	3	ʌʃ	4	ʌʃ	4	ʌʃ		
4.5	ʌʃ	5	Uʃ	5	aʃ	5	aʃ		

TABLE 7.4
/ʃ/ VOWEL COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	Iʃ	1	Iʃ	1	Iʃ	1	Iʃ	1	Iʃ
		2	æʃ			2	æʃ	2.5	aʃ
		3	ɛʃ					2.5	Uʃ

TABLE 7.5
/ʃ/ BLEND COMBINATIONS: I/A

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
———	1 ʃr	1 ʃr	1 ʃr	1 ʃr

TABLE 7.6
/ / BLEND COMBINATIONS: F/UA

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
———	———	1 ʃt	———	———

Table 7.1 (I/A) illustrates that there are many different contexts for /ʃ/ in the initial/accented position. Many of the phonetic contexts occur with equal frequency, so the ranks at each level cover a small range of differences. It should be noted that Level Two contains more contexts for /ʃ/ in the initial/accented position than any other level.

The phonetic context /ʃə/ ranks number one at all levels for /ʃ/ in the initial/unaccented position (Table 7.2). /ʃI/ ranks second at Levels Two through Four. /ʃə/ is the only context which occurs at Level One. At the other levels, /ʃə/ occurs at least eighty-nine times. /ʃI/, which ranks second, occurs ten or less times at each level (Appendix, Table 16.2). There is a great difference between rank one and rank two for /ʃ/ in the initial/unaccented position at all levels.

Table 7.3 (F/A) illustrates that the contexts for /ʃ/ in the final/accented position are consistent at all levels. /ɪʃ/ ranks number one at all levels. Since five different

contexts are the most that occur at any level, any differences which occur in rank are small.

Few contexts occur for /ʃ/ in the final/unaccented position. /Iʃ/ ranks number one at all levels.

/ʃ/ occurs in two blend combinations. /ʃr/ occurs in the initial/accented position (Table 7.5) at Levels Two, Three, Four, and Five. The most frequent occurrence of /ʃr/ is at Level Three, where it occurs six times (Appendix, Table 16.5). /ʃt/ occurs once at Level Three in the final/accented position for blend combinations (Table 7.6; Appendix, Table 16.6). In the first 10,000 words of the Thorndike-Lorge word list (Levels One through Five), only fourteen words contain /ʃ/ in a blend combination.

In comparing Tables 7.1 through 7.4, it is obvious that stress and syllabic position are important considerations when identifying the most frequent phonetic contexts for /ʃ/ singles. If only monosyllabic words were used for identifying phonetic contexts, the frequently occurring contexts of /ʃə/ and /Iʃ/ would be eliminated.

The following six tables illustrate the various phonetic contexts for /tʃ/ at all five levels of occurrence. /tʃ/ does not occur in blend combinations in the initial/accented position or in the initial/unaccented position.

TABLE 8.1
/tʃ/ VOWEL COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	tʃɛ	1.5	tʃæ	1	tʃæ	1.5	tʃI	1.5	tʃI
5	tʃi	1.5	tʃa	2.5	tʃI	1.5	tʃæ	1.5	tʃe
5	tʃI	3.5	tʃi	2.5	tʃa	3	tʃɝ	4	tʃi
5	tʃe	3.5	tʃI	4	tʃaI	4	tʃe	4	tʃɛ
5	tʃæ	5	tʃe	7	tʃi	5.5	tʃaI	4	tʃɝ
5	tʃa	6.5	tʃɛ	7	tʃɛ	5.5	tʃʌ	6.5	tʃa
5	tʃaI	6.5	tʃo	7	tʃɔ			6.5	tʃʌ
5	tʃɝ	8.5	tʃu	7	tʃu				
		8.5	tʃaI	7	tʃʌ				
		10	tʃɔI						

TABLE 8.2
/tʃ/ VOWEL COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	tʃɝ	1	tʃɝ	1.5	tʃɝ	1.5	tʃɝ	1.5	tʃɝ
2	tʃə	2	tʃə	1.5	tʃə	1.5	tʃə	1.5	tʃə
		3	tʃU	3	tʃU	3	tʃU	3	tʃU
		4.5	tʃI	4.5	tʃI	4.5	tʃI	4	tʃI
		4.5	tʃaI	4.5	tʃɛ	4.5	tʃɛ	5	tʃaI

TABLE 8.3
/tʃ/ VOWEL COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	itʃ	1.5	Itʃ	1.5	Itʃ	1	ætʃ	1	Itʃ
2.5	Itʃ	1.5	ætʃ	1.5	ætʃ	2	Itʃ	2	Etʃ
2.5	ʌtʃ	3	Etʃ	3	Etʃ	3	itʃ	3.5	itʃ
4	ætʃ	4.5	itʃ	4.5	itʃ	4	ɝtʃ	3.5	ʌtʃ
5.5	atʃ	4.5	ɝtʃ	4.5	atʃ	6.5	atʃ	5.5	otʃ
5.5	ɝtʃ	6.5	otʃ	6	ʌtʃ	6.5	otʃ	5.5	ɝtʃ
		6.5	ʌtʃ	8	otʃ	6.5	aUtʃ		
		8.5	Utʃ	8	aUtʃ	6.5	ʌtʃ		
		8.5	aUtʃ	8	ɝtʃ				

TABLE 8.4
/tʃ/ VOWEL COMBINATIONS: F/UA

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
———	1 Itʃ	———	1 Itʃ	1 Itʃ 2.5 ætʃ 2.5 aUtʃ

TABLE 8.5
/tʃ/ BLEND COMBINATIONS: F/A

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
1 ntʃ 2 rtʃ	1 ntʃ 2 rtʃ	1 ntʃ 2 rtʃ	1 ntʃ 2 rtʃ	1 ntʃ 2 rtʃt

TABLE 8.6
/tʃ/ BLEND COMBINATIONS: F/UA

Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
———	———	———	———	1 ntʃ

In Table 8.1 (I/A) it can be seen that many of the contexts for /tʃ/ occur with equal frequency. More contexts of /tʃ/ in the initial/accented position occur at Levels Two and Three than at the other levels. The contexts for /tʃ/ which occur are basically consistent at all levels.

/tʃɚ/ and /tʃə/ rank numbers one and two, respectively, at all levels for /tʃ/ in the initial/unaccented position (Table 8.2). Few contexts for /tʃ/ occur in this position, but those which do occur are consistent at all levels.

The phonetic contexts /Itʃ/ and /itʃ/ rank high at all levels for /tʃ/ in the final/accented position (Table 8.3).

Many of the contexts occur with equal frequency. Therefore, the range of the rank orders is small.

Table 8.4 (F/UA) shows that no contexts for /tʃ/ occur at Levels One and Three. One context occurs at Level Two; one context occurs at Level Four; and three contexts occur at Level Five. The frequencies of occurrence for these contexts are also small. /ɪtʃ/ occurs once at Levels Two and Four, and twice at Level Five. /ɛrtʃ/ and /aʊtʃ/ each occur once at Level Five (Appendix, Table 17.4).

/ntʃ/ and /rtʃ/ are the only phonetic contexts which occur for /tʃ/ blend combinations in the final/accented position at Levels One through Four. /ntʃ/ and /rtʃt/ occur at Level Five (Table 8.5).

Table 8.6 shows that no blend combinations occur for /tʃ/ in the final/unaccented position at Levels One through Four. /ntʃ/ occurs one time at Level Five (Appendix, Table 17.6).

In comparing Tables 8.1 through 8.4, it can be seen that for /tʃ/ singles, stress is an important variable. /tʃ/ occurs in more contexts in accented syllables than in unaccented syllables. Also, many of the contexts which occur, occur with equal frequency. This means the rank orders cover a small range of different positions.

/tʃ/ does not occur in any blend combinations in the initial/accented or the initial/unaccented positions. Table 8.5 and Table 8.6 show that /tʃ/ occurs in very few blend combinations in the final/accented and the final/unaccented

positions. Considering /tʃ/ in blend combinations is not an important factor when selecting /tʃ/ words which are representative of the /tʃ/ words in a child's language.

The next six tables illustrate the rank orders of the various phonetic contexts for /dʒ/ at all five levels of occurrence. /dʒ/ does not occur in any blend combinations in the initial/accented or the initial/unaccented positions.

TABLE 9.1
/dʒ/ VOWEL COMBINATIONS: I/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	dʒɛ	1	dʒɛ	1.5	dʒɛ	1	dʒɛ	1	dʒɛ
2.5	dʒɔI	2	dʒu	1.5	dʒʌ	2	dʒʌ	2	dʒu
2.5	dʒɝ	5	dʒI	3	dʒɔI	3	dʒI	4.5	dʒe
4.5	dʒa	5	dʒæ	4.5	dʒI	4	dʒu	4.5	dʒæ
4.5	dʒʌ	5	dʒa	4.5	dʒu	5	dʒi	4.5	dʒa
6	dʒɔ	5	dʒo	6	dʒɝ	7	dʒʊ	4.5	dʒɝ
		5	dʒʌ	8	dʒi	7	dʒɔI	8	dʒi
		8	dʒe	8	dʒe	7	dʒɝ	8	dʒI
		10	dʒi	8	dʒɔ	11	dʒe	8	dʒɔI
		10	dʒɔI	10.5	dʒæ	11	dʒæ	11.5	dʒɔ
		10	dʒɝ	10.5	dʒo	11	dʒa	11.5	dʒo
		13	dʒɔ			11	dʒɔ	11.5	dʒU
		13	dʒU			11	dʒo	11.5	dʒʌ
		13	dʒaI						

TABLE 9.2
/dʒ/ VOWEL COMBINATIONS: I/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	dʒɚ	1	dʒə	1	dʒ	1	dʒə	1	dʒə
2.5	dʒI	2	dʒɚ	2	dʒI	2	dʒI	2	dʒI
2.5	dʒɛ	3	dʒI	3	dʒɚ	3	dʒɚ	3	dʒɚ
		5	dʒɛ	5	dʒi	4.5	dʒi	4	dʒU
		5	dʒæ	5	dʒɛ	4.5	dʒu		
		5	dʒu	5	dʒaI	6	dʒaI		

TABLE 9.3
/dʒ/ VOWEL COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	edʒ	1	ɛdʒ	1.5	ɛdʒ	1	adʒ	1.5	ɛdʒ
3	Idʒ	2.5	Idʒ	1.5	ædʒ	2.5	ædʒ	1.5	ædʒ
3	ɛdʒ	2.5	edʒ	3	Idʒ	2.5	ʃdʒ	3.5	Idʒ
3	ʌdʒ	4	ædʒ	4.5	adʒ	4	ɛdʒ	3.5	ʌdʒ
		5	adʒ	4.5	ʃdʒ	6	Idʒ	6	idʒ
		6	ʃdʒ	7	idʒ	6	edʒ	6	edʒ
		8	idʒ	7	edʒ	6	ʌdʒ	6	ʃdʒ
		8	udʒ	7	ʌdʒ				
		8	ʌdʒ						

TABLE 9.4
/dʒ/ VOWEL COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	Idʒ	1	Idʒ	1	Idʒ	1	Idʒ	1	Idʒ
		2.5	ɛdʒ	3	edʒ			3.5	edʒ
		2.5	ædʒ	3	ɛdʒ			3.5	ɛdʒ
		5	udʒ	3	ædʒ			3.5	ædʒ
		5	aIdʒ					3.5	udʒ
		5	ədʒ						

TABLE 9.5
/dʒ/ BLEND COMBINATIONS: F/A

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
1	rdʒ	1	ndʒ	1	ndʒ	1	ndʒ	1.5	rdʒ
2	ndʒ	2	rdʒ	2	rdʒ	2	rdʒ	1.5	ldʒ

TABLE 9.6
/dʒ/ BLEND COMBINATIONS: F/UA

Rank	1	Rank	2	Rank	3	Rank	4	Rank	5
———		1	ndʒ	———		1	ndʒ	———	

Table 9.1 (I/A) shows that /dʒ/ occurs in many different contexts in the initial/accented position. It occurs in more contexts at Levels Two, Four, and Five, than at Levels One and Three. /dʒɛ/ ranks number one at all levels of occurrence. Many of the phonetic contexts occur with equal frequency, and no context occurs more than fourteen times (Appendix, Table 18.1).

The phonetic contexts /dʒɝ/, /dʒə/, and /dʒI/ consistently rank high at all levels for /dʒ/ in the initial/unaccented position (Table 9.2). The context /dʒ/ only occurs at Level Three, and it ranks number one at this level. The context /dʒ/ also occurs more frequently than any other context at any level (Appendix, Table 18.2).

Table 9.3 (F/A) shows that after Level One, the number of different phonetic contexts for /dʒ/ increases. /ɛdʒ/ consistently ranks high at all levels. There is, however, considerable variation in the ranks of the other phonetic contexts of /dʒ/. By referring to the Appendix of this paper, Table 18.3, it can be seen that the frequencies of occurrence for all contexts of /dʒ/ in the final/accented position are seven or less. Therefore, the difference between the upper and lower ranks is not great.

The phonetic context /ɪdʒ/ ranks number one at all levels for /dʒ/ in the final/unaccented position (Table 9.4). It is the only context which occurs at Levels One and Four. All contexts which occur at Levels Two, Three, and Five are consistent between the levels.

As previously mentioned, no blend combinations of /dʒ/ occur in the initial/accented or initial/unaccented position. As shown in Table 9.5 (F/A Blends), few contexts occur for /dʒ/ blends in the final/accented position. /rdʒ/ occurs at each level of occurrence. /ndʒ/ occurs at Levels One through Four. /ldʒ/ occurs only at Level Five. The frequency with which these contexts occur is also small. The largest frequency of occurrence is for /ndʒ/ which occurs eight times at both Level Two and Level Four (Appendix, Table 18.5). When /dʒ/ blend combinations occur in the final/unaccented position (Table 9.6), the number of contexts which occur is even smaller. /ndʒ/ occurs twice at Level Two and twice at Level Four (Appendix, Table 18.6). No other contexts occur in this position for /dʒ/.

In comparing Tables 9.1 through 9.4, it can be seen that stress and syllabic position are important factors when considering the most frequently occurring phonetic contexts of /dʒ/ singles. /dʒ/ occurs in more contexts in accented syllables than in unaccented syllables. Also, the rank orders for the phonetic contexts of /dʒ/ vary according to stress and syllabic position.

The most obvious observation which can be made when comparing the blend combinations of /dʒ/ (Tables 9.5 and 9.6), is the small number of contexts which occur. Only 38 words out of the 10,000 most frequently occurring words contain /dʒ/ in a blend combination.

In summary, the phonetic context rank orders for the nine phonemes considered are basically stable at all levels of occurrence. Therefore, generally once the most frequent phonetic contexts are known, it would not matter what grade level words were chosen. The ranks would remain consistent.

There are a few exceptions to this trend. In this study, any shift in rank of five or more positions was considered significant. This amount of variance was arbitrarily chosen. For consonant singles, the number of different phonetic contexts possible is seventeen. The first five ranks were considered high, the second five ranks were considered middle, and the bottom seven were considered low. The number of possible blend combinations is very large. However, a shift in rank of five or more positions was still considered significant since all possible combinations do not occur for any sound. The blend combination distributions are not as consistent as the single combinations for any sound. This result should be expected because of the large number of possible combinations, and the relatively small frequencies with which most blend contexts occur. Most shifts in rank orders of phonetic contexts (singles and blends) occur when the frequencies of occurrence of the contexts are small at all levels of occurrence.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

The purpose of this study was to determine the phonetic contexts and the frequency with which they occurred for nine frequently misarticulated phonemes in the 10,000 most frequently occurring words of the English language. Previous research has indicated that the assessment of articulatory behavior and the choice of stimulus words in therapy should concentrate on the phonetic contexts which occur with the highest frequency.

The following questions were posed at the beginning of this study:

1. What are the phonetic contexts for /r, ɝ, ɚ, l, s, z, ʃ, tʃ, dʒ/ at:
   a. Grade Levels 1 and 2 of the Thorndike-Lorge list
   b. Grade Levels 3 and 4 of the Thorndike-Lorge list
   c. Grade Levels 5 and 6 of the Thorndike-Lorge list
   d. Grade Levels 7 and 8 of the Thorndike-Lorge list
   e. Grade Levels 9 through 12 of the Thorndike-Lorge list
2. For each of the nine most frequently misarticulated phonemes is there a difference between the phonetic context rank orders at each grade level?

The words used were the 10,000 most frequently occurring words of the Thorndike-Lorge list as analyzed by Griffith and Miner according to occurrence of a phoneme in a word, the syllabic position of the phoneme, and the stress of the syllable in which it occurred. The investigator determined the contexts for each of the nine phonemes. The frequencies of the contexts were determined according to the syllabic position of the phoneme and the stress of the syllable in which the phoneme occurred. The rank orders were determined from this information.

The phonetic context distributions of each of the nine phonemes are reported. Also, the phonetic context distributions derived by Griffith and Miner for /r, ɝ, ɚ, l, s, z, ʃ, tʃ, dʒ/ at Level One and the distributions for /r, s, l/ for Level Two derived by Dorn and Schneider are reported.

Conclusions

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

1. Comparison of the phonetic context rank orders of each sound at each level of occurrence indicates that for the most part, rank ordering is a consistent phenomenon throughout the 10,000 most frequently occurring words.
2. Most shifts in rank orders of phonetic contexts occur when the frequencies of occurrence of the contexts are small at all levels of occurrence.

3. The variables of stress and syllabic position are necessary considerations when determining the most frequent phonetic contexts of the nine phonemes analyzed.
4. The distribution of consonants on the variable of type of combination (single versus blend) is such that more contexts occur in the form of singles.
5. The distribution of consonants on the variable of stress is such that more contexts occur in accented syllables.
6. The distribution of the vowels /ɪ, ʊ/ on the variable syllabic position is such that more contexts occur in the final and medial positions than in the initial position.
7. The distribution of the vowel /ɪ/ on the variable of stress is such that more contexts occur in accented syllables.
8. The distribution of the vowel /ʊ/ on the variable of stress is such that more contexts occur in unaccented syllables.

Implications for Future Research

The present study has implications for future research as follows:

1. The present study reported the phonetic context rank orders and the frequencies of occurrence for the contexts of nine phonemes at all levels of occurrence. No attempt was made to explain why certain contexts occur more frequently than others. The question "Are phonetic

contexts rank ordered for frequency of occurrence because of ease of production?" needs to be answered. Criteria for determining factors which determine ease of production will first have to be defined.

2. The findings of the present study and those of Griffith and Miner, Dorn, and Schneider, provide information for any study which needs phonetic context information, including studies concerned with occurrences at specific grade levels.

APPENDIX

TABLE 10.1
FREQUENCY OF OCCURRENCE
/r/ VOWEL COMBINATIONS: I/A

Context	1	2	3	4	5
ri	6	6	8	9	2
rI	4	10	13	13	9
re	5	17	14	23	9
rɛ	7	14	20	22	13
ræ	2	9	12	11	8
ra	1	6	4	6	3
rɔ	1	-	-	2	-
ro	4	5	9	4	10
rU	-	-	-	-	1
ru	3	5	3	5	7
raI	5	9	6	6	5
raU	2	-	1	1	1
rɔI	-	-	2	-	1
rʃ	-	-	-	-	-
rʒ	-	-	-	-	-
rə	-	-	-	-	-
rʌ	2	4	9	7	6

TABLE 10.2
FREQUENCY OF OCCURRENCE
/r/ VOWEL COMBINATIONS: I/UA

Context	1	2	3	4	5
ri	-	-	3	6	6
rI	16	41	72	62	62
re	-	-	6	4	8
rɛ	-	5	13	4	6
ræ	-	1	-	2	2
ra	-	-	-	-	-
rɔ	-	-	-	-	-
ro	1	5	2	2	3
rU	-	-	-	-	-
ru	-	1	2	2	3
raI	-	-	3	3	7
raU	-	-	-	-	-

TABLE 10.2-Continued

Context	1	2	3	4	5
rɔI	-	-	-	-	1
rɝ	-	-	-	-	-
rʊ	-	-	-	-	-
rə	2	10	16	27	23
rʌ	-	-	-	-	-

TABLE 10.3
FREQUENCY OF OCCURRENCE
/r/ VOWEL COMBINATIONS: F/A

Context	1	2	3	4	5
ir	-	-	-	-	-
Ir	13	13	25	27	34
er	-	-	-	-	-
ɛr	24	23	40	39	30
ær	5	9	11	11	10
ar	11	26	38	38	31
ɔr	13	23	25	19	24
or	7	7	34	42	15
Ur	6	5	10	9	7
ur	-	-	-	-	-
aIr	4	4	9	10	7
aUr	2	1	2	1	1
ɔIr	-	-	-	-	-
ɝr	-	-	-	-	-
ʊr	-	-	-	-	-
ər	-	-	1	-	-
ʌr	-	-	-	-	-

TABLE 10.4
FREQUENCY OF OCCURRENCE
/r/ VOWEL COMBINATIONS: F/UA

Context	1	2	3	4	5
ir	-	-	-	-	-
Ir	-	2	1	8	4
er	-	-	-	-	-
ɛr	-	7	23	18	22
ær	-	1	2	1	-
ar	-	-	4	7	12
ɔr	-	3	5	10	2
or	-	1	4	3	14

TABLE 10.4—Continued

Context	1	2	3	4	5
Ur	-	1	1	-	1
ur	-	-	-	-	-
aIr	-	1	2	2	-
aUr	-	-	-	1	-
ɔIr	-	-	-	-	-
ɝr	-	-	-	-	-
ɚr	-	-	-	-	-
ər	-	2	21	19	18
ʌr	-	-	-	-	-

TABLE 10.5
FREQUENCY OF OCCURRENCE
/r/ BLEND COMBINATIONS: I/A

Context	1	2	3	4	5
pr	13	28	-	10	41
br	10	17	31	-	20
tr	12	24	25	-	25
dr	7	12	7	-	8
kr	5	19	27	-	14
gr	11	16	37	-	14
fr	9	17	22	-	21
θr	2	4	7	9	5
spr	2	1	4	3	2
str	7	8	30	25	12
skr	-	3	6	6	8
ʃr	-	-	6	1	5

TABLE 10.6
FREQUENCY OF OCCURRENCE
/r/ BLEND COMBINATIONS: I/UA

Context	1	2	3	4	5
pr	3	17	-	4	29
tr	3	13	23	-	22
dr	2	1	3	-	6
θr	-	-	-	-	-
br	-	1	7	-	4
kr	-	2	2	-	7
gr	-	8	7	-	5
fr	-	3	1	-	1
spr	-	-	1	-	-
skr	-	-	1	-	3
str	-	1	-	-	-

TABLE 10.7
FREQUENCY OF OCCURRENCE
/r/ BLEND COMBINATIONS: F/A

Context	1	2	3	4	5
rt	10	12	12	15	8
rd	8	4	10	9	4
rk	3	6	5	9	2
rs	3	2	2	10	8
rθ	2	-	2	1	-
rm	5	5	2	9	5
rn	2	4	5	9	5
rtʃ	1	3	3	2	-
rdʒ	3	-	3	2	1
rdz	-	-	-	-	1
rtʃt	-	-	-	-	1
rf	-	1	2	1	-
rv	-	-	-	2	-
rst	-	-	-	1	-
rz	-	-	3	1	-
rnt	-	-	-	1	-
rl	-	1	-	1	-
rp	-	-	2	-	-
rlz	-	1	-	-	-
rmpθ	-	1	-	-	-

TABLE 10.8
FREQUENCY OF OCCURRENCE
/r/ BLEND COMBINATIONS: F/UA

Context	1	2	3	4	5
rt	-	-	2	1	5
rd	-	-	4	1	4
rz	-	-	-	1	1
rθ	-	-	3	1	1
rm	-	-	-	1	-
rk	-	-	1	-	-
rs	-	-	1	-	-
rn	-	-	1	-	-
rdz	-	-	-	-	2

TABLE 11.1
FREQUENCY OF OCCURRENCE
/ʃ/ COMBINATIONS: I/A

Context	1	2	3	4	5
ʃ	1	-	1	-	-
ʃl	-	1	-	-	-
ʃn	-	2	1	2	-
ʃdʒ	-	1	-	1	-
ʃθ	1	-	2	2	-
ʃv	-	-	-	1	-

TABLE 11.2
FREQUENCY OF OCCURRENCE
/ʃ/ COMBINATIONS: I/UA

Context	1	2	3	4	5
ʃb	-	-	1	-	-

TABLE 11.3
FREQUENCY OF OCCURRENCE
/ʃ/ COMBINATIONS: F/A

Context	1	2	3	4	5
pʃ	2	9	2	7	3
fʃ	1	7	4	8	3
sʃ	4	6	8	4	3
θʃ	1	1	1	-	2
hʃ	1	-	2	3	1
dʒʃ	3	2	1	1	3
wʃ	1	6	1	1	2
tʃ	-	5	9	12	6
bʃ	-	2	1	5	6
lʃ	-	2	2	2	-
kʃ	-	8	4	5	4
mʃ	-	7	2	2	3
dʃ	-	1	-	-	-
jʃ	-	1	-	-	-
vʃ	-	3	6	8	2
gʃ	-	-	1	-	1
nʃ	-	-	2	2	-
ʃʃ	-	-	1	-	1
hwʃ	-	-	-	1	-
zʃ	-	-	-	2	2

TABLE 11.4
FREQUENCY OF OCCURRENCE
/ɜ/ COMBINATIONS: F/UA

Context	1	2	3	4	5
sɜ	-	-	1	-	-
tɜ	-	-	2	-	1
vɜ	-	-	1	-	-
bɜ	-	-	-	-	1
fɜ	-	-	-	-	1
pɜ	-	-	-	-	4
wɜ	-	-	-	-	1

TABLE 11.5
FREQUENCY OF OCCURRENCE
/ɜ/ COMBINATIONS: M/A

Context	1	2	3	4	5
bɜ	2	3	1	3	3
tɜ	2	3	4	2	-
fɜ	1	3	2	1	2
gɜ	1	-	-	1	1
sɜ	1	5	5	1	5
θɜ	1	2	-	1	-
hɜ	2	3	-	1	1
lɜ	1	1	2	1	-
tʃɜ	1	-	-	1	-
wɜ	4	3	3	5	1
zɜ	-	5	3	-	1
dɜ	-	1	-	-	1
kɜ	-	3	3	1	1
vɜ	-	3	1	3	7
hwɜ	-	1	-	1	-
pɜ	-	4	1	3	-
nɜ	-	3	-	1	-
mɜ	-	1	1	1	-
ʃɜ	-	1	-	-	-
dʒɜ	-	-	2	1	-
jɜ	-	-	1	-	-

TABLE 11.6
FREQUENCY OF OCCURRENCE
/ʃ/ COMBINATIONS: M/UA

Context	1	2	3	4	5
bʃ	-	-	-	-	4
kʃ	-	-	-	-	1
wʃ	-	-	4	-	6
vʃ	-	-	1	-	-

TABLE 12.1
FREQUENCY OF OCCURRENCE
/ʃ/ COMBINATIONS: I/UA

Context	1	2	3	4	5
ʃd	-	1	-	-	1
ʃt	-	-	-	1	-

TABLE 12.2
FREQUENCY OF OCCURRENCE
/ʃ/ COMBINATIONS: F/UA

Context	1	2	3	4	5
ʃ	4	18	15	7	10
pʃ	5	24	7	15	23
bʃ	5	14	3	8	7
tʃ	16	55	42	62	40
dʃ	8	25	22	25	18
fʃ	5	10	6	12	4
vʃ	10	27	20	25	16
gʃ	3	8	5	4	5
sʃ	3	2	6	8	9
θʃ	1	1	-	1	3
ðʃ	13	10	6	4	4
lʃ	1	16	12	17	14
mʃ	3	7	8	3	8
nʃ	4	9	8	13	11
tʃʃ	4	21	8	17	8
dʒʃ	2	9	3	4	5
hʃ	1	-	-	-	-
ʒʃ	2	1	3	3	2

TABLE 12.2—Continued

Context	1	2	3	4	5
kɝ	-	9	5	10	8
jɝ	-	5	2	2	2
ʃɝ	-	2	2	3	3
zɝ	-	1	4	7	2

TABLE 12.3
FREQUENCY OF OCCURRENCE
/ɝ/ COMBINATIONS: M/UA

Context	1	2	3	4	5
dɝ	1	1	-	-	3
zɝ	-	1	1	2	-
sɝ	-	1	-	-	-
mɝ	-	1	-	-	-
tɝ	-	5	1	2	4
θɝ	-	2	-	-	-
vɝ	1	-	4	-	2
hɝ	-	-	1	-	-
bɝ	-	2	5	1	2
tʃɝ	-	2	-	1	-
jɝ	-	1	-	1	-
kɝ	1	-	-	-	1
fɝ	1	1	1	3	2
wɝ	2	4	6	4	5
pɝ	-	1	-	1	-

TABLE 13.1
FREQUENCY OF OCCURRENCE
/1/ VOWEL COMBINATIONS: I/A

Context	1	2	3	4	5
1i	4	8	6	7	7
1I	5	14	16	13	16
1e	6	5	9	7	10
1ɛ	9	9	13	9	17
1æ	3	8	15	13	7
1a	2	5	6	11	3
1ɔ	7	4	10	7	2
1o	4	2	5	8	5
1U	1	-	1	3	3
1u	1	5	8	11	6
1aI	5	10	10	14	7

TABLE 13.1—Continued

Context	1	2	3	4	5
laU	1	-	1	1	-
lɔI	-	-	1	2	-
lɑ	-	-	-	-	-
lɝ	1	1	3	-	-
lə	-	-	5	1	-
lʌ	2	10	-	7	2

TABLE 13.2
FREQUENCY OF OCCURRENCE
/l/ VOWEL COMBINATIONS: I/UA

Context	1	2	3	4	5
li	-	-	1	1	-
lI	10	14	104	138	124
le	-	-	8	1	7
lɛ	-	-	2	4	2
læ	-	-	2	3	2
la	-	-	-	1	1
lɔ	-	-	2	3	2
lo	-	2	3	1	1
lU	-	-	-	2	-
lu	-	1	-	2	1
laI	1	5	1	3	4
laU	-	-	-	-	-
lɔI	-	-	-	-	-
lɑ	-	2	8	9	9
lɝ	-	-	-	-	-
lə	3	6	19	21	32
lʌ	-	-	-	-	-

TABLE 13.3
FREQUENCY OF OCCURRENCE
/l/ VOWEL COMBINATIONS: F/A

Context	1	2	3	4	5
il	2	6	7	3	9
Il	12	17	29	32	26
el	3	10	12	8	8
ɛl	6	24	26	29	20
æl	3	12	20	21	17
al	4	14	15	18	15
ɔl	10	4	12	17	12

TABLE 13.3—Continued

Context	1	2	3	4	5
ol	8	5	10	6	7
Ul	2	3	3	4	1
ul	4	6	1	7	6
aIl	3	6	5	3	5
aUl	-	2	1	1	1
ɔIl	2	1	2	3	1
ɝl	-	-	-	-	-
ɚl	1	2	1	2	-
əl	-	-	-	-	-
ʌl	1	3	7	8	12

TABLE 13.4
FREQUENCY OF OCCURRENCE
/1/ VOWEL COMBINATIONS: F/UA

Context	1	2	3	4	5
il	-	1	-	-	-
Il	-	3	3	4	8
el	-	-	1	4	1
ɛl	-	-	2	4	1
æl	-	1	2	4	4
al	-	-	4	1	-
ɔl	2	1	3	4	2
ol	-	-	1	1	2
Ul	-	-	1	-	-
ul	-	-	-	2	-
aIl	-	1	2	1	2
aUl	-	-	-	-	-
ɔIl	-	-	-	-	1
ɝl	-	-	-	-	-
ɚl	-	-	-	-	-
əl	9	12	53	64	57
ʌl	-	2	-	-	-
l̩	-	-	-	1	3

TABLE 13.5
FREQUENCY OF OCCURRENCE
/l/ BLEND COMBINATIONS: I/A

Context	1	2	3	4	5
pl	1	21	24	21	14
bl	4	16	-	16	16
kl	10	-	20	-	19
gl	2	-	6	-	8
fl	4	-	13	-	15
sl	1	19	12	19	10
spl	1	4	3	4	2
skl	-	1	2	1	-

TABLE 13.6
FREQUENCY OF OCCURRENCE
/l/ BLEND COMBINATIONS: I/UA

Context	1	2	3	4	5
bl	1	-	3	-	6
gl	2	-	1	-	-
pl	-	4	-	4	7
spl	-	1	-	1	-
kl	-	-	2	-	3
fl	-	-	-	-	2

TABLE 13.7
FREQUENCY OF OCCURRENCE
/l/ BLEND COMBINATIONS: F/A

Context	1	2	3	4	5
lp	1	1	3	1	1
lt	4	12	7	12	7
ld	13	10	13	10	7
lk	1	2	2	2	-
lf	5	5	2	5	-
lv	1	4	-	4	2
lvz	1	1	1	1	-
ls	1	2	2	2	-
lθ	1	1	-	1	1
lz	-	-	3	-	2
lʤ	-	-	-	-	1
lm	-	4	2	4	-
lb	-	-	1	-	-
rl	-	1	-	-	-

TABLE 13.8
FREQUENCY OF OCCURRENCE
/l/ BLEND COMBINATIONS: F/UA

Context	1	2	3	4	5
lt	-	1	1	1	1
ld	-	1	1	1	3
lf	-	-	-	-	2
ls	-	1	-	1	-
lθ	-	-	1	-	-
gl	-	-	-	-	1

TABLE 14.1
FREQUENCY OF OCCURRENCE
/s/ VOWEL COMBINATIONS: I/A

Context	1	2	3	4	5
si	9	4	17	14	18
sI	12	15	17	33	29
se	5	7	9	7	10
sɛ	22	21	22	22	29
sæ	1	10	10	10	14
sa	-	1	7	8	7
sɔ	5	2	1	5	7
so	4	6	9	2	5
sU	-	-	-	-	1
su	2	2	4	4	2
saI	9	3	9	8	10
saU	2	-	2	-	-
sɔI	1	-	-	-	-
sɑ	-	-	-	-	-
sʃ	6	6	13	5	7
sɚ	-	-	-	-	-
sʌ	10	11	16	11	11
sj	-	1	-	-	-

TABLE 14.2
FREQUENCY OF OCCURRENCE
/s/ VOWEL COMBINATIONS: I/UA

Context	1	2	3	4	5
si	-	1	-	1	1
sI	-	14	35	30	38
se	-	-	1	3	1
sɛ	1	7	8	4	9

TABLE 14.2—Continued

Context	1	2	3	4	5
sæ	-	2	1	-	8
sɑ	-	-	-	-	-
sɔ	-	-	-	1	-
so	1	2	1	2	1
sU	-	-	-	2	-
su	-	-	3	2	4
saI	-	-	7	5	14
saU	-	-	1	1	2
sɔI	-	-	-	-	-
sɝ	3	-	5	7	7
sɚ	-	-	-	-	-
sə	8	10	31	35	36
sʌ	-	-	-	2	1
sl̩	-	5	2	9	3
sn̩	-	10	12	10	12

TABLE 14.3
FREQUENCY OF OCCURRENCE
/s/ VOWEL COMBINATIONS: F/A

Context	1	2	3	4	5
is	3	4	5	4	5
Is	10	12	16	18	21
es	6	4	7	6	-
ɛs	9	10	32	21	26
æs	6	11	15	20	19
as	1	8	8	9	6
ɔs	3	5	1	5	4
os	1	-	4	1	2
Us	-	-	1	-	1
us	1	3	5	4	3
aIs	3	5	6	4	4
aUs	1	2	2	4	2
ɔIs	1	2	2	1	1
ɝs	-	-	-	-	-
ɚs	-	4	3	2	3
əs	-	-	-	-	-
ʌs	2	6	10	14	6

TABLE 14.4
FREQUENCY OF OCCURRENCE
/s/ VOWEL COMBINATIONS: F/UA

Context	1	2	3	4	5
is	-	-	-	1	-
Is	8	24	66	77	91
es	-	-	1	2	3
Es	-	5	4	5	6
æs	-	1	2	3	4
as	-	1	-	2	2
Js	-	-	1	1	-
os	-	-	-	-	-
Us	-	-	-	-	-
us	-	-	-	1	1
aIs	-	2	1	-	-
aUs	-	1	1	2	1
JIs	-	-	-	-	-
ɝs	-	1	2	-	-
ɚs	-	-	-	-	-
ɔs	4	10	46	73	57
ʌs	-	-	-	-	-
l̩s	-	-	-	-	-
n̩s	-	-	2	2	1

TABLE 14.5
FREQUENCY OF OCCURRENCE
/s/ BLEND COMBINATIONS: I/A

Context	1	2	3	4	5
sp	11	-	39	-	29
spl	1	4	3	4	2
spr	2	-	4	3	2
sk	4	18	23	18	12
skw	1	2	-	2	3
st	19	65	41	65	36
str	7	25	30	25	12
sm	3	5	4	5	7
sn	1	3	7	3	3
sl	1	19	-	19	10
sw	1	14	-	14	4
skl	-	1	2	1	-
skr	-	6	6	6	8

TABLE 14.6
FREQUENCY OF OCCURRENCE
/s/ BLEND COMBINATIONS: I/UA

Context	1	2	3	4	5
sp	-	5	7	5	3
sk	-	-	2	-	2
skr	-	-	1	-	3
st	-	16	9	16	14
spl	-	1	-	1	-
sm	-	-	1	-	-
spr	-	-	1	-	-

TABLE 14.7
FREQUENCY OF OCCURRENCE
/s/ BLEND COMBINATIONS: F/A

Context	1	2	3	4	5
sk	1	3	3	3	4
st	19	60	19	60	21
ns	8	21	-	21	10
nst	1	-	2	-	-
ls	1	2	2	2	-
ps	1	-	-	-	-
ts	4	-	-	-	2
ks	2	-	11	-	4
kst	1	-	2	-	-
rs	3	10	2	10	8
sp	-	3	2	3	1
rst	-	1	-	1	-

TABLE 14.8
FREQUENCY OF OCCURRENCE
/s/ BLEND COMBINATIONS: F/UA

Context	1	2	3	4	5
ps	-	-	-	-	1
rs	-	-	1	-	-
ks	-	-	3	-	10
kst	-	-	-	-	1
sk	-	-	-	-	1
st	2	9	13	9	13
ns	4	30	1	30	23
nst	-	-	-	-	1
ls	-	-	-	1	-

TABLE 15.1
FREQUENCY OF OCCURRENCE
/z/ VOWEL COMBINATIONS: I/A

Context	1	2	3	4	5
zi	-	3	2	-	2
zI	1	6	5	3	2
ze	-	1	-	2	1
zɛ	-	6	3	2	3
zæ	1	3	2	1	1
za	-	2	-	3	1
zɔ	-	2	1	1	-
zo	-	1	1	-	1
zU	-	1	-	-	-
zu	-	1	1	-	2
zaI	1	4	2	1	3
zaU	-	-	-	1	-
zɔI	-	-	-	-	-
zɝ	-	-	-	-	-
zɚ	-	6	3	2	4
zə	-	-	-	-	-
zʌ	1	-	-	-	3

TABLE 15.2
FREQUENCY OF OCCURRENCE
/z/ VOWEL COMBINATIONS: I/UA

Context	1	2	3	4	5
zi	-	-	-	-	3
zI	1	7	6	10	-
ze	-	-	-	-	-
zɛ	-	-	1	-	-
zæ	-	1	-	1	-
za	-	-	-	-	2
zɔ	-	-	-	-	-
zo	-	-	-	1	-
zU	-	-	-	-	-
zu	-	-	-	-	-
zaI	-	-	2	-	-
zaU	-	-	-	-	-
zɔI	-	-	-	-	-
zɝ	-	2	1	2	3
zɚ	-	-	-	-	-
zə	3	3	4	3	3
zʌ	-	-	-	-	-
zl̩	-	1	1	2	-
zn̩	-	3	2	6	2

TABLE 15.3
FREQUENCY OF OCCURRENCE
/z/ VOWEL COMBINATIONS: F/A

Context	1	2	3	4	5
iz	4	8	3	4	1
Iz	6	11	6	9	4
ez	1	6	5	3	3
ɛz	3	5	4	5	-
ɹ̠z	2	1	2	1	3
az	-	2	2	2	2
ɔz	2	1	1	1	-
oz	5	13	8	6	3
Uz	-	1	-	-	-
uz	6	7	4	6	1
aIz	4	7	6	3	5
aUz	-	2	-	-	1
ɔIz	-	1	2	1	-
ɚz	-	-	-	-	-
ɝz	-	2	-	-	-
ə z	-	-	-	-	-
ʌz	4	3	2	2	1

TABLE 15.4
FREQUENCY OF OCCURRENCE
/z/ VOWEL COMBINATIONS: F/UA

Context	1	2	3	4	5
iz	-	1	2	3	2
Iz	1	4	5	5	6
ez	1	-	1	-	2
ɛz	-	2	3	3	-
ɹ̠z	-	1	-	1	1
az	-	-	-	-	-
ɔz	-	-	1	-	-
oz	-	-	-	2	-
Uz	-	-	-	-	-
uz	-	1	-	2	-
aIz	2	6	10	6	11
aUz	-	-	-	-	-
ɔIz	-	-	-	-	-
ɚz	-	2	-	1	1
ɝz	-	-	-	-	-
ə z	-	-	-	1	-
ʌz	-	-	-	-	-
l̩z	-	-	-	2	-

TABLE 15.5
FREQUENCY OF OCCURRENCE
/z/ BLEND COMBINATIONS: F/A

Context	1	2	3	4	5
lvz	1	1	1	1	-
mz	-	1	-	1	2
nz	-	2	2	2	-
rz	-	2	3	2	-
zd	-	-	1	-	2
lz	-	-	3	-	2
bz	-	-	-	-	1
rdz	-	-	-	-	1

TABLE 15.6
FREQUENCY OF OCCURRENCE
/z/ BLEND COMBINATIONS: F/UA

Context	1	2	3	4	5
mz	1	-	1	-	1
zd	-	1	-	1	-
rz	-	1	-	1	1
nz	-	-	1	-	4
rdz	-	-	-	-	2

TABLE 16.1
FREQUENCY OF OCCURRENCE
/ʃ/ VOWEL COMBINATIONS: I/A

Context	1	2	3	4	5
ʃi	2	6	1	1	1
ʃI	1	3	4	4	3
ʃe	2	4	2	1	4
ʃɛ	1	5	2	2	1
ʃæ	1	4	3	3	2
ʃa	2	3	1	1	3
ʃɔ	-	1	-	5	-
ʃo	4	3	-	2	1
ʃU	3	4	4	1	-
ʃu	1	1	1	-	-
ʃaI	-	2	-	1	1
ʃaU	1	1	-	-	-
ʃɔI	-	-	-	-	-
ʃɝ	-	-	-	-	-
ʃʊ	-	1	1	-	1
ʃə	-	-	-	-	-
ʃʌ	-	1	5	1	1

TABLE 16.2
FREQUENCY OF OCCURRENCE
/ʃ/ VOWEL COMBINATIONS: I/UA

Context	1	2	3	4	5
ʃi	-	-	-	-	-
ʃI	-	3	10	10	5
ʃe	-	-	-	-	-
ʃɛ	-	-	-	-	1
ʃæ	-	-	-	-	3
ʃa	-	-	-	1	-
ʃɔ	-	-	-	-	-
ʃo	-	-	1	1	-
ʃU	-	-	1	-	1
ʃu	-	-	-	-	3
ʃaI	-	1	-	-	-
ʃaU	-	-	-	-	-
ʃɔI	-	-	-	-	-
ʃɝ	-	-	-	2	-
ʃə	-	-	-	-	-
ʃʌ	7	89	93	96	94
	-	-	-	-	-

TABLE 16.3
FREQUENCY OF OCCURRENCE
/ʃ/ VOWEL COMBINATIONS: F/A

Context	1	2	3	4	5
iʃ	-	-	-	-	-
Iʃ	5	21	21	18	13
eʃ	-	-	-	-	-
ɛʃ	3	8	7	8	-
æʃ	1	8	6	8	-
aʃ	2	-	1	1	1
ɔʃ	-	-	-	-	-
oʃ	-	-	-	-	-
Uʃ	-	4	-	-	1
uʃ	-	-	-	-	-
aIʃ	-	-	-	-	-
aUʃ	-	-	-	-	-
ɔIʃ	-	-	-	-	-
ɝʃ	-	-	-	-	-
əʃ	-	-	-	-	-
ʌʃ	1	8	2	5	-

TABLE 16.4
FREQUENCY OF OCCURRENCE
/ʃ/ VOWEL COMBINATIONS: F/UA

Context	1	2	3	4	5
iʃ	-	-	-	-	-
Iʃ	3	22	15	16	13
eʃ	-	-	-	-	-
ɛʃ	-	1	-	-	-
æʃ	-	2	-	2	-
aʃ	-	-	-	-	1
ɔʃ	-	-	-	-	-
oʃ	-	-	-	-	-
Uʃ	-	-	-	-	1
uʃ	-	-	-	-	-
aIʃ	-	-	-	-	-
aUʃ	-	-	-	-	-
ɔIʃ	-	-	-	-	-
ɝʃ	-	-	-	-	-
ɚʃ	-	-	-	-	-
əʃ	-	-	-	-	-
ʌʃ	-	-	-	-	-

TABLE 16.5
FREQUENCY OF OCCURRENCE
/ʃ/ BLEND COMBINATIONS: I/A

Context	1	2	3	4	5
ʃr	-	1	6	1	5

TABLE 16.6
FREQUENCY OF OCCURRENCE
/ʃ/ BLEND COMBINATIONS: F/UA

Context	1	2	3	4	5
ʃt	-	-	1	-	-

TABLE 17.1
FREQUENCY OF OCCURRENCE
/tʃ/ VOWEL COMBINATIONS: I/A

Context	1	2	3	4	5
tʃi	1	6	1	-	2
tʃI	1	6	3	6	3
tʃe	1	4	-	2	3
tʃɛ	2	3	1	-	2
tʃæ	1	7	6	6	-
tʃa	1	7	3	-	1
tʃɔ	-	-	1	-	-
tʃo	-	3	-	-	-
tʃU	-	-	-	-	-
tʃu	-	2	1	-	-
tʃaI	1	2	2	1	-
tʃaU	-	-	-	-	-
tʃɔI	-	1	-	-	-
tʃɝ	-	-	-	-	-
tʃɜ	1	-	-	3	2
tʃə	-	-	-	-	-
tʃʌ	-	-	1	1	1

TABLE 17.2
FREQUENCY OF OCCURRENCE
/tʃ/ VOWEL COMBINATIONS: I/UA

Context	1	2	3	4	5
tʃi	-	-	-	-	-
tʃI	-	1	1	2	2
tʃe	-	-	-	-	-
tʃɛ	-	-	1	2	-
tʃæ	-	-	-	-	-
tʃa	-	-	-	-	-
tʃɔ	-	-	-	-	-
tʃo	-	-	-	-	-
tʃU	-	5	3	5	5
tʃu	-	-	-	-	-
tʃaI	-	1	-	-	1
tʃaU	-	-	-	-	-
tʃɔI	-	-	-	-	-
tʃɝ	3	21	8	8	6
tʃɜ	-	-	-	-	-
tʃə	1	8	8	8	6
tʃʌ	-	-	-	-	-

TABLE 17.3
FREQUENCY OF OCCURRENCE
/tʃ/ VOWEL COMBINATIONS: F/A

Context	1	2	3	4	5
itʃ	5	3	3	4	2
Itʃ	3	6	5	5	6
etʃ	-	-	-	-	-
ɛtʃ	-	4	4	-	5
ætʃ	2	6	5	9	-
atʃ	1	-	3	1	-
ɔtʃ	-	-	-	-	-
otʃ	-	2	1	1	1
Utʃ	-	1	-	-	-
utʃ	-	-	-	-	-
aItʃ	-	-	-	-	-
aUtʃ	-	1	1	1	-
ɔItʃ	-	-	-	-	-
ɚtʃ	-	-	-	-	-
ɝtʃ	1	3	1	2	1
ətʃ	-	-	-	-	-
ʌtʃ	3	2	2	1	2

TABLE 17.4
FREQUENCY OF OCCURRENCE
/tʃ/ VOWEL COMBINATIONS: F/UA

Context	1	2	3	4	5
itʃ	-	-	-	-	-
Itʃ	-	1	-	1	2
etʃ	-	-	-	-	-
ɛtʃ	-	-	-	-	-
ætʃ	-	-	-	-	1
atʃ	-	-	-	-	-
ɔtʃ	-	-	-	-	-
otʃ	-	-	-	-	-
Utʃ	-	-	-	-	-
utʃ	-	-	-	-	-
aItʃ	-	-	-	-	-
aUtʃ	-	-	-	-	1
ɔItʃ	-	-	-	-	-
ɚtʃ	-	-	-	-	-
ɝtʃ	-	-	-	-	-
ɔtʃ	-	-	-	-	-
ʌtʃ	-	-	-	-	-

TABLE 17.5
FREQUENCY OF OCCURRENCE
/tʃ/ BLEND COMBINATIONS: F/A

Context	1	2	3	4	5
ntʃ	3	6	4	6	8
rtʃ	1	2	3	2	-
rtʃt	-	-	-	-	1

TABLE 17.6
FREQUENCY OF OCCURRENCE
/tʃ/ BLEND COMBINATIONS: F/UA

Context	1	2	3	4	5
ntʃ	-	-	-	-	1

TABLE 18.1
FREQUENCY OF OCCURRENCE
/dʒ/ VOWEL COMBINATIONS: I/A

Context	1	2	3	4	5
dʒi	-	2	2	3	2
dʒI	-	4	4	6	2
dʒe	-	3	2	1	3
dʒɛ	4	11	6	14	10
dʒæ	-	4	1	1	3
dʒa	2	4	-	1	3
dʒɔ	1	1	2	1	1
dʒo	-	4	1	1	1
dʒU	-	1	-	2	1
dʒu	-	6	4	4	4
dʒaI	-	1	-	-	-
dʒaU	-	-	-	-	-
dʒɔI	3	2	5	2	2
dʒɝ	-	-	-	-	-
dʒɚ	3	2	3	2	3
dʒə	-	-	-	-	-
dʒʌ	2	4	6	8	1

TABLE 18.2
FREQUENCY OF OCCURRENCE
/dʒ/ VOWEL COMBINATIONS: I/UA

Context	1	2	3	4	5
dʒi	-	-	1	2	-
dʒI	1	2	4	6	5
dʒe	-	-	-	-	-
dʒɛ	1	1	1	-	-
dʒæ	-	1	-	-	-
dʒa	-	-	-	-	-
dʒɔ	-	-	-	-	-
dʒo	-	-	-	-	-
dʒU	-	-	-	-	1
dʒu	-	1	-	2	-
dʒaI	-	-	1	1	-
dʒaU	-	-	-	-	-
dʒɔI	-	-	-	-	-
dʒɚ	2	6	2	4	4
dʒɝ	-	-	-	-	-
dʒə	-	10	19	12	14
dʒʌ	-	-	-	-	-

TABLE 18.3
FREQUENCY OF OCCURRENCE
/dʒ/ VOWEL COMBINATIONS: F/A

Context	1	2	3	4	5
idʒ	-	1	2	-	1
Idʒ	1	6	5	1	2
edʒ	2	6	2	1	1
ɛdʒ	1	7	7	2	3
ædʒ	-	5	7	3	3
adʒ	-	3	3	4	-
ɔdʒ	-	-	-	-	-
odʒ	-	-	-	-	-
Udʒ	-	-	-	-	-
udʒ	-	1	-	-	-
aIdʒ	-	-	-	-	-
aUdʒ	-	-	-	-	-
ɔIdʒ	-	-	-	-	-
ɚdʒ	-	-	-	-	-
ɝdʒ	-	2	3	3	1
ədʒ	-	-	-	-	-
ʌdʒ	1	1	2	1	2

TABLE 18.4
FREQUENCY OF OCCURRENCE
/dʒ/ VOWEL COMBINATIONS: F/UA

Context	1	2	3	4	5
idʒ	-	-	-	-	-
Idʒ	1	20	15	17	12
edʒ	-	-	1	-	1
ɛdʒ	-	2	1	-	1
ædʒ	-	2	1	-	1
adʒ	-	-	-	-	-
ɔdʒ	-	-	-	-	-
odʒ	-	-	-	-	-
Udʒ	-	-	-	-	-
udʒ	-	1	-	-	1
aIdʒ	-	1	-	-	-
aUdʒ	-	-	-	-	-
ɔIdʒ	-	-	-	-	-
ɝdʒ	-	-	-	-	-
ʃdʒ	-	-	-	-	-
ədʒ	-	1	-	-	-
ʌdʒ	-	-	-	-	-

TABLE 18.5
FREQUENCY OF OCCURRENCE
/dʒ/ BLEND COMBINATIONS: F/A

Context	1	2	3	4	5
ndʒ	2	8	4	8	-
rdʒ	3	2	3	2	1
ldʒ	-	-	-	-	1

TABLE 18.6
FREQUENCY OF OCCURRENCE
/dʒ/ BLEND COMBINATIONS: F/UA

Context	1	2	3	4	5
ndʒ	-	2	-	2	-

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