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An Investigation of Constant Position Within Words and Syllables

Carla W. Hess

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AN INVESTIGATION OF CONSONANT POSITION
WITHIN WORDS AND SYLLABLES

by

Carla W. Hess

B.S. in General Studies, Montana State College 1962

A Thesis

Submitted to the Faculty

of the

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This thesis submitted by Carla W. Hess in partial fulfillment of the requirements for the Degree of Master of Science in the University of North Dakota is hereby approved by the Committee under whom the work has been done.

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May, 1967

Carla W. Hess

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ABSTRACT

Disagreement exists among speech clinicians regarding the appropriate classification of consonant position in the evaluation of defective articulation.

To accomplish the purposes of this investigation--to determine if consonants in initial, medial, and final positions within words are perceived as entities distinct from consonants that initiate or terminate syllables, and to determine if the concept of "medial" is valid in the evaluation of defective articulation--reading passages in which consonant positions were systematically varied were devised. These passages were tape-recorded with selected test consonants misarticulated by the substitution of other consonants in various positions within words and syllables. Sixty-one students with academic experience in articulation evaluation and sixty-one students without such experience rated the articulation defectiveness of the forty-two test passages on nine-point equal-appearing-interval scales.

It was concluded from this investigation that neither the classification of consonant positions as initial, medial, or final nor the classification of consonant positions as syllable-initiating and syllable-terminating appear to be adequate. A classification of consonant positions as syllable-initiating, medial-syllable-terminating, and word-terminating appears to be appropriate.

There appears to be justification for abandoning the traditional

concept of "medial" consonants and replacing it with a differential labeling of consonants based on their position within the syllable.

Students without experience in articulation evaluation rate consonant substitutions as being more defective than do students with such experience. However, the findings regarding consonant positions were highly consistent between the two groups of subjects.

CHAPTER I

A CONSIDERATION OF CONSONANT POSITIONS WITHIN WORDS AND SYLLABLES

Considerable insecurity has been generated among speech pathology students and speech clinicians using popular articulation texts, tests, techniques, and materials based on the assumption that it is useful to differentiate American English consonants that are produced in the initial, medial, and final positions of words. Some investigators who question this assumption contend that consonants function as initiators and terminators of syllables and that the concept of "medial" is meaningless.

The purposes of this investigation were to attempt to determine if consonants in initial, medial, and final positions within words are perceived as entities distinct from consonants that initiate or terminate syllables, and to examine whether the concept of "medial" is valid in the evaluation of defective articulation.

Investigators whose opinions about the basic unit of speech and its position in continuous speech are of concern in this study include the traditionalists who point out that consonants are produced in initial, medial, and final positions in words; the motor phoneticians and others who contend that consonants are more usefully considered as initiators and terminators of syllables; the investigators whose findings have indicated that the results are the same whether the sound is considered relative to its position in the word or in the syllable; and those investigators

who call for further study of the matter.

The traditional approach of speech clinicians to articulation evaluation and therapy has been based on the premise that the phoneme is the basic unit of sound production. Curtis (1954, p. 147) wrote:

It has been assumed that the continuous flow of speech can be broken down or quantized, as we customarily do when we transcribe speech into phonetic symbols, and that these units have integral characteristics which are independent of the contexts in which they occur.

Traditionally, speech sounds have been observed to exist in larger units--words--and within word units to be produced in initial, medial, and final positions.

These observations have led to a generally-accepted philosophy expressed by Van Riper (1963, p. 223):

To summarize, we cannot understand or diagnose an articulation case without making a phonetic analysis of his speech in terms of (1) the sounds which are defective; (2) the type of error in terms of substitution, omission, insertion, or distortion; and (3) the location of the error within the word (initial, medial, or final). This sort of analysis is not academic. It has vital importance for therapy.

The articulation test materials, object and picture identification tests, word lists, sentences, and passages used by most speech clinicians have been organized to include the consonants in all three positions (or those positions in which they occur) within words. In developing the Arizona Articulation Proficiency Score, Barker and England devised a simplified scale for speech correctionists. The consonant sound values were divided equally among the three word positions: initial, medial, and final. In justifying this division of sounds, they wrote, "This was prompted by the assumption that the majority of speech correctionists use this method of recording misarticulations" (1962, p. 24).

The typical approach in therapy seems to be elicitation of the correctly-produced sound in isolation and then the habituation of this production in nonsense syllables, in words in which the sound is located initially, medially, and finally, and then in word groups. (Nemoy and Davis, 1937; Milisen, 1954; Berry and Eisenson, 1956; Johnson and Others, 1956; West, Ansberry and Carr, 1957; Van Riper, 1963; and Irwin, 1965.)

The theories of H. R. Stetson and others are in opposition to the traditional approach of speech clinicians to articulation evaluation and therapy. McDonald (1964) reprinted Chapter One, "The Basic Conceptions of Phonology," from Stetson's book, Motor Phonetics. The following quotations from Stetson (1951) summarize his views with which this investigation is concerned:

There has been some general recognition of the articulation as the fundamental event in phonology, rather than the acoustic pattern. These articulatory events which figure as signals and symbols in speech must be classified and handled with reference to their actual function, in the processes of utterance. The various lists and classification which prove useful in phonology are derived from the functions of consonants and vowels in the syllables of speech (McDonald, 1964, p. 10).

It has seemed to some phonologists that a row of "phonemes" is easier to handle than a train of syllables. But the syllable is always to be considered; it embodies the syllabic and non-syllabic; it is the unit for the "tones" of the tone languages; it is the stressed and the unstressed unit of the feet of patterned verse. The syllable is the unit which incorporates the syllable factors, and in turn is incorporated in the units of the foot and breath group (McDonald, 1964, p. 5).

The consonant movement is always an auxiliary movement. The consonant functions only in a syllable. . . . The vowel is an articulation which has the function of shaping the vocal canal for the chest pulse, the consonant is an articulation which has the function of delimiting the chest pulse of the syllable. It is only in the coordination of the syllable pulse that they act as vowel and consonant. They may be named as if separate but that is merely a convenient abstraction. A vowel is a specific quality of a syllable when uttered through a specific vocal-canal shape; a consonant is a specific way of releasing or of arresting a syllable (McDonald, 1964, p. 7).

It is impossible to teach the "separate sounds" of a language (the sounds cannot be separated), and then assembled into syllables (syllables are not assemblies) (McDonald, 1964, p. 11).

In this school of thought the basic unit of speech is the syllable. Within the syllable, consonants function to initiate and terminate the vocalic or syllabic element--the vowel. This theory contradicts the traditional practices of therapists who approach speech as if the phoneme were the basic unit and as if consonant phonemes should be classified as being produced initially, medially, and finally within words.

Another investigator presenting "an argument in favor of abandoning the 'initial, medial, final classification of consonants, and replacing it with a classification based on the consonant's relationship to its syllable, and syllable's position within the word or phrase in which it is spoken" was Keenan (1961, p. 174). In this classification system the traditional initial and final sounds would be external prevocalic or post-vocalic and would be considered to initiate or terminate a syllable. The concept of "medial" would be abandoned entirely. Keenan (1961, p. 172) suggested that in his experience "abandoning the concept of 'medial' entirely and regarding the troublesome sounds as initial or final elements of syllables, both the clinician and the patient were able to understand what had previously seemed a nebulous, ill-defined problem."

Barker (1960, p. 86), too, indicated that medial sounds may not be appropriate in articulation tests and therapy. She concluded the following from her findings in an investigation of articulation proficiency:

According to the results of this study, considering the syllable positions of consonants produces the same results as considering the position of the consonant sound in a word. A medial sound which is misarticulated may be related to the initial or final position in the syllable rather than to its medial position in a word.

In addition to the disagreement on the basic units that comprise

speech and the positions of these units in continuous speech, another point of opposition of those who object to the traditional assumptions of speech clinicians is opposition to the belief that phonemes have integral characteristics independent of phonetic context.

Shohara recorded her observations in a report of an investigation that spanned a ten-year period (McDonald, 1964, p. 21):

I was struck then by the phenomena that the same consonants, considered as letters or even as phonetic symbols, are pronounced at different times by very different muscle movements. Further I observed that when a group of movements typical of an isolated consonant is combined with another consonant or a vowel, the result is not the sum of the two movements, but a new group, and consequently a new sound. . . . It follows from these considerations that there is no such thing as a definite group of speech movements uniformly repeated on successive pronunciations of the "same letter." Successive sounds or movements modify one another by the very process of interaction. Accordingly, since the pattern of the muscle movements of every sound varies widely with the varying character of the preceding and succeeding movements, an objective study of speech sounds and movements and its practical application in speech training must be based not upon the individual isolated sounds, but upon the succession of movements. Any consideration of the individual sound as an isolated unit is arbitrary and artificial since it disregards the integrated character of the entire series. Thus the character of the individual sounds in the series should be observed in the form in which they occur in the series of movements.

Other investigators are in agreement with Shohara on the significance of phonetic contexts in speech production. (Curtis, 1954, pp. 156, 157) noted:

The data of these recent studies also seem to assign a much more important and significant role to the transitional variations resulting from the interactions of consecutive sounds than we have tended to assign to them when we have operated on the assumption that speech can be quantized into independent units.

Spriesterbach and Curtis (1951, p. 491) found in a study of misarticulation and discrimination of speech sounds that ear training adapted to the particular phonetic contexts in which the individual's misarticulations occur is probably more effective than the gross type now commonly employed. Sherman (1952, p. 212) concluded on the basis of her findings

in a study of the influence of vowels on the recognition of adjacent consonants that "the percent recognition of the consonants may depend upon the adjacent vowel." Van Riper and Irwin (1958, p. 64) advise:

It is also important to explore the phonetic consistency of the error. Does the speaker make the error only in certain words, in certain phonetic contexts. . . . or does he also produce the error when uttering nonsense syllables or when producing the isolated sound? . . . No child should receive an articulation examination without some estimate of consistency being made."

McDonald (1964, p. 115) summarized his opposition to traditional articulation theory:

1. It is word oriented and words do not appear in speech as entities but only as a sequence of syllables.
2. Consonants do not appear in initial, medial or final positions in speech. They exist as auxiliary movements in the syllable and function as releasers and arrestors of the syllable.
3. The sampling of phonetic contexts and consequently, the movement sequences, is accidental rather than systematic.
4. Physiologically speaking, there are three types of consonants: simple, compound, and abutting. Abutting consonants create many contexts which require unique and complex movement sequences. The three-position test does not provide opportunities to observe the child's ability to perform these movements.

The third group of investigators whose findings are of concern is that group whose findings have indicated that the results are the same whether the sound is considered relative to its position in the word or in the syllable.

In a comparison of the two methods of determining an Articulation Score--by prorating consonants equally in all positions as Wood (1949) suggested or by considering consonants relative to their positions in syllables as French, Carter, and Koenig (1930) suggested--the findings indicated that the methods produced similar results when the speech of 45 children was rated by trained judges (Barker, 1960, p. 87).

Jordan (1960) conducted a study to evaluate relationships between measures of defectiveness of articulation obtained from articulation

test responses and those obtained from listener ratings of short samples of connected speech.

Results of the present study suggest some justification for testing final sounds in as much as the final sounds variable appears to contribute to the multiple regression with severity no less than and possibly slightly more than the arresting sounds variable (p. 313).

In light of the contradictions and controversy, the conclusions of the fourth group of investigators, that the position of speech sounds within the units of speech requires further study, seems obvious. Sherman (1952, p. 209) concluded that "further research is needed before any adequate explanation of these variations with position can be offered." Van Riper and Irwin (1958, p. 7) wrote that "the location of the error within the word is also of importance. . . . More research in listener evaluation of error position is needed before we can be sure of these observations, but they represent the best information we now possess."

Motor phoneticians have presented convincing evidence that physiologically a consonant initiates or terminates a syllable. Speech clinicians, however, who base their evaluations of speech almost exclusively on auditory perception of speech, point out that consonants function initially, medially, and finally within lexical, if not syllable, units. Van Riper and Irwin (1958, p. 65) made a point regarding the concept of medial position that may have more far-reaching implications:

The concept of medial position is probably an acoustic or psychological concept rather than a truly phonetic one. The unit of utterance seems to be the syllable. Hence, articulation errors on the consonant sounds occur only initially and finally in terms of their production. Nevertheless, a defective sound occurring in the initial position of an unstressed syllable buried medially within a long word seems to be more difficult for the speaker to discriminate than one that begins or ends the word.

Herein may lie the key to the relationship between the dichotomous points of view of some motor phoneticians and some speech clinicians. In regard to production consonants may initiate and terminate syllables. In regard to reception consonants may be perceived as initial, medial, and final within words.

CHAPTER II

AN INVESTIGATION OF CONSONANT POSITION WITHIN WORDS AND SYLLABLES

To accomplish the purposes of this investigation--to determine if consonants in initial, medial, and final positions within words are perceived as entities distinct from consonants that initiate or terminate syllables, and to attempt to determine if the concept of "medial" is valid in the evaluation of defective articulation--reading passages in which consonant positions were systematically varied were devised. (See Appendix I for the test passages.) These tape-recorded speech passages were presented to subjects for rating. In order to provide the subjects with a basis for comparing the sound positions within words and syllables, selected test consonants were systematically misarticulated by substituting for them some other consonant. To make the stimulus materials the same for all listening subjects, the passages were recorded on a Wollensak Model 1500 tape recorder at seven and one half inches per second.

Subjects

Two groups of subjects participated in this investigation. Sixty-one junior, senior, and graduate students majoring in speech pathology rated the articulation defectiveness of the passages. (Hereafter these subjects will be referred to as "sophisticated subjects" since they had received training in articulation evaluation.) Sixty-one sophomore, junior, senior and graduate students majoring in various scientific fields, but all enrolled in a physics laboratory course, performed the listening task.

None of the group had taken any of the courses in the speech pathology curriculum, and none of them had ever had speech therapy. (Hereafter these subjects will be referred to as "naive subjects.")

All prospective participants with known hearing losses were disqualified as subjects.

None of the subjects was aware of the purpose of the investigation prior to rating the test passages.

Consonant Positions

A consideration of the following word and its component consonant sounds is provided to define functionally the various consonant positions: [sɛlfɪ]. [s] is initial in the word; [s] initiates a syllable. [l] is medial in the word; [l] terminates a syllable. [f] is medial in the word; [f] initiates a syllable. [ʃ] is final in the word; [ʃ] terminates a syllable.

Throughout the remainder of this thesis, consonants in the initial positions of words will be referred to as "initial" or "I." Consonants in the medial positions of words will be referred to as "medial" or "M." Consonants in the final positions of words will be referred to as "final" or "F." Consonants in the initial positions of syllables that do not initiate words will be referred to as "medial-initiating" or "Mi." Medial-initiating consonants do not include initial consonants. The consonants in the terminal positions of syllables that do not terminate words will be referred to as "medial-terminating" or "Mt." Medial-terminating consonants do not include final consonants.

Test Consonants and Consonant Substitutions

Six test consonant sounds were selected for this investigation: [s], [k], [v], [ə], [tʃ], [dʒ]. Selection of these six consonants was

based on the following considerations:

1. The consonant must occur in the initial, medial, and final positions of words.
2. The consonant must occur in the initial and final positions of syllables.
3. The consonant must occur in these positions in a sufficient number of words related closely enough in meaning to be incorporated into a meaningful passage of controlled length.
4. The test consonant must be distinguishable from the substituted consonant on the play back of the tape-recorded passages in a classroom situation to as many as 30 listeners.

The test consonants were misarticulated by substituting another phoneme for each of them. Evidence exists that the type of defectiveness--that is, omission, substitution, or distortion--will contribute to listener distractibility (Roe and Milisen, 1942, pp. 37-50; Wright, 1954, pp. 19-27; and Jordan, 1960, pp. 303-319). In order to control the type of defectiveness of misarticulations so that it would not vary from passage to passage, one consonant phoneme was substituted for each test consonant: [t/θ], [s/s], [t/k], [b/v], [t/t]], and [d/dʒ]. The selection of the consonants to be substituted for the test consonants was based on the following considerations.

1. The substitution commonly occurs in defective speech.
2. The substituted consonant could be readily distinguished from the test consonant on the play back of the tape-recorded passages.
3. The substituted consonant could be easily and consistently produced in continuous speech by the investigator when it was substituted for the test consonant.

Test Passages

Two passages of different word content were constructed on the basis of each test consonant. One passage contained 30 of the test consonants. Ten of the consonants were in the initial position; ten were medial; and ten were final. Of the ten medial consonants five were medial-initiating and five were medial-terminating. The second passage based on each test consonant contained 30 of the test consonants. Ten of the con-

sonants were medial-initiating; ten were medial-terminating; and five were in the initial and five in the final positions of words.

Each test passage presenting the test consonant in the initial, medial, and final positions was recorded four times. Each test passage was recorded once with no substitutions for the test consonant, once with substitutions for the ten initial test consonants, once with substitutions for the ten medial test consonants, and once with substitutions for the ten final test consonants.

Each test passage presenting the test consonant in the medial-initiating and medial-terminating positions was recorded three times. Each test passage of this type was recorded once with no substitutions for the test consonant, once with substitutions for the ten medial-initiating test consonants, and once with substitutions for the ten medial-terminating test consonants.

Thus, this investigation was based on 42 passages including these seven types: initial, medial, and final test consonants correctly produced--six passages; initial substitutions--six passages; medial substitutions--six passages; final substitutions--six passages; medial-initiating and medial-terminating test consonants correctly produced--six passages; medial-initiating substitutions--six passages; and medial-terminating substitutions--six passages. Of these 42 passages, 12 were considered to be correctly articulated; 30 contained ten sound substitutions each.

Several factors were considered in the construction of the test passages. The passage length was controlled to range from 49 to 53 words. The intent was to construct passages that would be about 15 seconds in length--a length sufficient for listener judgment of defectiveness according to the findings of other investigators. In a study of the measurement of

articulation defectiveness in five-, ten-, and fifteen-second segments of continuous speech, Morrison (1955, p. 350) found that there was "high agreement between expert and naive raters with respect to placement of the segments along a severity continuum for each of the three segment lengths." Sherman and Cullinan (1960, p. 196) found in their study of procedures for scaling articulation that there was close agreement between the scale values based upon listener responses to one-minute speech samples and ten-second segments from the one-minute samples. The fifteen-second passage length was chosen instead of a five- or ten-second length so that 30 test consonants could be incorporated into a passage.

Another consideration in passage construction was the number of defectively-produced consonants in the passage. Based on Perrin's (1954) finding that a high correlation exists between the number of articulation errors and listener judgments of severity of articulation defect and Jordan's (1960) finding that the number of defective consonants emerged as that variable most highly related to judged severity, the number of defectively-produced consonants was held at none or ten in all test passages.

Another variable that was controlled was the ratio of substitutions for the test consonant to the total number of test consonants within the test passage. Van Riper and Irwin (1958, p. 6) stated that "when the misarticulation occurs on a frequently used sound it will cause a greater listener evaluation of abnormality than when it occurs on a sound used very rarely. Wood (1949) assumed that misarticulated sounds that occur frequently in continuous speech distract the listener more than those that occur infrequently. He devised a method for weighing sounds on the basis of the frequency of their use. In the current investigation the frequency of the test consonant was controlled so that each passage contained 30 test

consonants of which ten were misarticulated within a passage.

Another concern in passage construction was controlling test consonant position within words and syllables. Initial consonants were always the first sound of a word, and they were always followed by a vowel. Medial-initiating consonants were followed by a vowel but preceded by a consonant. The preceding consonant was not the same as the test consonant or its substitute consonant. Thus the existence of a medial-initiating position was clearly established. Medial-terminating consonants were preceded by a vowel and followed by a consonant different from the test consonant or its substitute. Thus the existence of a medial-terminating position remained clearly established. For example, the word "exercise" could be used in the passage testing the medial-initiating and medial-terminating [k]. It would become [ɛtsɜsaɪz] when [t] was substituted for the medial-terminating [k]. "Practice," however, could not have been used in this test passage. Substituting [t] for [k] would produce [prætɪs], and the determination of the position of [t] would be less clearly established than when an abutting consonant situation was present.

Words containing the test consonant within compound consonants or blends were excluded. "Blends" is used here to refer to two or more consecutive consonant sounds located initially or finally within words or initially or finally within syllables. Words containing a medial test consonant preceded and followed by a vowel sound were excluded on the basis of test consonant position uncertainty.

The procedure used by Barker (1960, p. 81) was adopted for this investigation:

Words were divided into phonetic syllables, not orthographic syllables. The dictionary was not used as an authority for either syllabification or pronunciation. Such words as every, preference,

and average were divided into two syllables according to colloquial pronunciation. A single pronunciation was assigned to each of the recorded words according to the most typical pronunciation in reasonably enunciated speech.

Another concern in passage construction was the controlling of test consonant position within the passage. An attempt was made to distribute the test consonants within the various positions evenly throughout the test passages.

When the test passages had been written, they were ordered in groups of five: I, M, F, Mi, and Mt for each of the six test consonants. These 30 passages were numbered 1-30 and were randomized using a table of random numbers. This was the order in which the passages containing misarticulations were tape recorded.

The subjects were given an opportunity to hear the intended meaning of each test passage. The correctly articulated passage for each test consonant was read prior to the first misarticulated presentation of the passage. For example, the first of the randomized passages was [t/k]medially. This passage was assigned the second position on the tape recording, being preceded by the correctly-articulated test passage for initial, medial, and final [k]. This procedure provided the subjects with a standard by which to determine when a substitution had occurred. For example, when a substitution changed the meaning of a word ([mædʒ] to [mæd]), this would be interpreted as an articulation error.

Instructions

Two sets of instructions to the subjects (see Appendix II) were included on the tape played for all the subjects. The first set of instructions was followed by seven sample passages. The subjects were instructed not to record judgments for the sample passages. The sample

passages were presented to acquaint the subjects with the listening task, to familiarize them with the rating procedure, and to provide the subjects with a sample of the range of articulation defectiveness displayed by the passages.

The sample passages were followed by a second set of instructions after which an opportunity was provided for the subjects to ask questions.

The playing of the two sets of instructions, sample passages and 42 test passages took approximately 45 minutes.

Scale

A nine-point equal-appearing interval scale was the scale chosen for rating the articulation defectiveness of the test passages. Sherman and Moodie (1957, p. 704) noted that this scale is frequently used in experimentation with speech disorders. In a study designed to compare several psychological scaling methods including equal-appearing intervals, paired comparisons, and constant sums, for scaling defectiveness of articulation of short segments from the continuous speech of children, they concluded:

In view of the demonstrated reliability of scale values obtained by the method of equal-appearing intervals and their close agreement with the internally consistent scale values obtained by the method of successive intervals, the method of equal-appearing intervals would, in general, be the preferred choice for the task of scaling short segments of speech with respect to articulation defectiveness. The simplicity of the method, including computational procedures, makes possible the scaling of many more speech samples with a reasonable amount of time and labor than either of the other two methods.

Sherman and Cullinan (1960, p. 191) found in another study concerned with psychological scaling of defective articulation by the method of an equal-appearing interval scale that "reliable scale values of defectiveness of articulation for short segments of speech, five seconds or ten seconds long, have been obtained by this method."

In investigations by Lewis and Sherman (1951), Morrison (1955), Sherman and Morrison (1955), Sherman (1955), Sherman and Moodie (1957), Prather (1960) Sherman and Cullinan (1960) and Stitt and Huntington (1963) the equal-appearing interval scale extending from one, for least severe, to nine, for most severe, was employed.

In her investigation of the scaling of defective articulation by direct-magnitude estimation, Prather (1960, p. 381) discussed the disadvantages of the equal-appearing interval scale:

The method itself has certain inherent weaknesses that prohibit some investigators from accepting it as the most desirable method available for scaling the defectiveness of articulation. By this method all observers are forced to use an absolute scale; individual and group biases cannot be corrected or removed. The presence of an end-effect, that is, piling at the end intervals is another weakness. Even if all of the above limitations could be eliminated, the method would still yield an interval scale which lacks an absolute zero.

In the present investigation the extremes of the interval scale were renamed in an attempt to eliminate the presence of an end-effect. Instead of ranging from "least defective" to "most defective," the scales (see Appendix III) employed in the present investigation ranged from "normal" to "unintelligible." Because of the inclusion of the 12 correctly articulated passages, a piling of the ratings at or near the "1" rating on the articulation rating scale was expected. The ratings of the other 30 passages, however, were expected to range throughout the scale. Since the subjects would not, because of terminology, have to determine a "normal" or an "unintelligible" passage as they would if the end ratings were indicated as "least defective" and "most defective;" it was suspected that the subjects would not be so likely to fall into the pattern of rating the passages at the extremes of the scales.

Prather pointed out that an interval scale is an absolute scale

that does not have an absolute zero. For the purposes of this study, this limitation was not pertinent. The concern herein was not the ratio of the defectiveness of one scale to that of another, but it was the relative magnitude of the defectiveness of articulation that was of concern. Thus the interval scale was adequate.

An absolute zero was not required in this investigation. The absolute absence of articulation defectiveness was not a concern herein although passages presumed to be "normal" were included. The absence of an absolute zero was not disadvantageous.

Prather related one other weakness of the equal-appearing interval scale: individual or group biases cannot be removed. A bias of concern in this investigation was the effect of previous experience in evaluating articulation defectiveness on the relative magnitude of articulation defectiveness ratings. The participation of 61 subjects in each of two groups with different academic backgrounds permitted comparison of the judgments of articulation defectiveness by subjects trained in articulation evaluation with the judgments of subjects not so trained.

CHAPTER III

A DISCUSSION OF THE FINDINGS IN AN INVESTIGATION OF CONSONANT POSITION WITHIN WORDS AND SYLLABLES

The data collected in the 122 ratings of the articulation defectiveness of the 42 passages of continuous speech were variously grouped and analyzed.

Ratings on the 12 passages containing no intended sound substitutions were extracted from among the ratings of the other 30 passages. An analysis of variance was computed¹ on the ratings of the 12 passages by the sophisticated subjects (Table 1) and by the naive subjects (Table 2). The mean rating for each of the 12 correct passages was computed for the sophisticated and for the naive subjects (Table 3).

The 12 correctly-articulated passages were included to provide a standard for subject ratings. Theoretically, all 12 passages were "normal;" and thus, they should have merited mean ratings of 1.00. The sources of variance and the level at which these sources contributed to the variation of the ratings from 1.00 are recorded in Tables 1 and 2.

¹Statistical computations were done on an IBM Computer 360.

Table 1.--Analysis of variance of the ratings by sophisticated subjects of 12 passages with no intended sound substitutions

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test Ratio	Significance
Consonant Position	1	0.02	0.02	0.02	No
Test Consonant Position X Consonant	5	78.03	15.60	15.44	Yes*
Consonant	5	8.61	1.72	1.70	No
Within	732	740.13	1.01	..	..
Total	743	826.79	..	..	..

* Significance at the .01 level.

** Significance at the .05 level.

Table 2.--Analysis of variance of the ratings by naive subjects of 12 passages with no intended sound substitutions

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test Ratio	Significance
Consonant Position	1	3.36	3.36	1.38	No
Test Consonant	5	280.75	56.15	23.09	Yes*
Position X Consonant	5	14.16	2.83	1.16	No
Within	732	1779.58	2.43	..	..
Total	743	2077.85	..	..	..

* Significance at the .01 level.

** Significance at the .05 level.

Table 3.--Mean ratings by all subjects of 12 passages with no intended sound substitutions

Test Consonants	Sophisticated Subjects		Naive Subjects	
	Correct (I,M,F,)	Correct (Mi,Mt)	Correct (I,M,F,)	Correct (Mi,Mt)
k	1.15	1.16	1.73	1.73
s	1.06	1.12	1.39	1.27
v	1.40	1.60	1.96	2.08
θ	1.91	2.13	3.13	3.32
dʒ	1.35	1.23	2.85	2.32
tʃ	1.90	1.48	2.66	2.19

Tables 1 and 2 reveal that consonant position within the word did not contribute significantly (.05 level) to the observed variation of the ratings of the 12 passages by the sophisticated subjects nor by the naive subjects. This finding could be expected. Since the test consonants were consistently articulated without substitution of other consonants in all positions, there was no basis for judgment of consonant position. Therefore, consonant position should not have contributed significantly to the variation from 1.00 of the subjects' ratings.

Tables 1 and 2 reveal that the test consonant was a significant (.01 level) source of rating variation. It can be further noted that this variable contributes most of the observable variation of the ratings.

Since the passages were about the same length, since they contained the same number of test consonants, and since the test consonants were consistently articulated correctly, the factors contributing to the amount of perceived defectiveness, indicated by the magnitude of the variation of the mean ratings (Table 3) from 1.00, could have been due to any of several factors or a combination thereof. First, the correctly-articulated consonants may have been perceived as being defective. This possibility seems doubtful, however. That test consonant and its substitution between which it was reported by subjects to be most difficult to distinguish were [v] and [b]. As is shown in Table 3 the passages based on [v] were not rated the most defective. [θ], [tʃ], and [dʒ] passages were rated more defective by one or both groups of subjects.

Another factor that may have contributed to the perception of defectiveness of the correct passages was phonetic context. Phonetic contexts are reputed to affect sound production and perception (see pp. 5-7 of this study). It did not seem possible to control phonetic contexts and still adhere to the other limitations defined for this investigation--

position of test consonants, number of test consonants, distribution of test consonants throughout the passages, and passage length. Consequently, the test consonants and their distributions were produced in "chance" rather than "controlled" phonetic contexts, except to the extent that controlling consonant position resulted in controlled context (see p. 16 of this study).

The test passages reveal that the phonetic contexts were quite variable.

Another factor that may have contributed to the perception of defectiveness of the correct passages was semantic, grammatic, and syntactic context. For those consonants occurring more frequently in speech, the [s] and the [k], the passages were considerably less difficult in vocabulary and in syntactical and grammatical construction. The [θ], [dʒ], and [tʃ], occurring less frequently in words and speech, required more involved and difficult vocabulary, word arrangements, and word relationships in order to incorporate the 30 test consonants into a passage of approximately 50 words and to have those consonants appropriately located within syllables, words, and passages. Table 3 reveals that the passages based on the less-frequently-occurring consonants were more severely rated than those based on frequently-occurring consonants.

In Tables 1 and 2 it is indicated that the interaction of consonant position and test consonant was not a significant (.05 level) factor in subject ratings of defectiveness. As with consonant position, there was no basis for subject evaluation of a test consonant in any specific position since the articulation of the test consonants was consistent throughout each passage.

A comparison of Tables 1 and 2 reveals naive subjects' ratings to be more variable than the ratings of sophisticated subjects.

Table 3 displays the mean ratings for each of the 12 correct passages. From least defective to most defective, the sophisticated subjects' ratings of the passages for the six test consonants can be ranked in this order: [s], [k], [dʒ], [v], [tʃ], and [θ]. The ratings of the naive subjects can be ranked in this order: [s], [k], [v], [dʒ], [tʃ], and [θ]. It is notable that the rank orders are the same except for the interchange of position of the [v] and the [dʒ].

It can be noted from the array of mean ratings in Table 3 that when an I-M-F passage was judged to be more defective, than the Mi-Mt passage for the same consonant by one group of subjects, it was judged to be more defective by the other group as well. However, the level of defectiveness perceived by the naive subjects was consistently greater than that perceived by the sophisticated subjects.

Tables 4 and 5 present an analysis of variance of the ratings by the two groups of subjects of the 30 passages in which consonant substitution was varied. For both groups of subjects, consonant position, sound substitution, and the interaction between the consonant position and sound substitution contributed significantly (.01 level) to the variation of the obtained ratings. The sound-substitution factor was the greatest source of variation which indicates that ratings of severity were more variable on the basis of the nature of the test sound and its substitution than they were on the basis of consonant position.

Although the comparison of the effect on subject ratings of articulation defectiveness due to the sound-substitution variable is not of primary concern in this study, a consideration of the mean ratings of the 30 test passages by the sophisticated subjects (Table 6) and by the naive subjects (Table 7) reveals some interesting trends. The sophisticated

subjects rated the substitutions in the following order from least defective to most defective: [b/v], [t/θ], [t/k], [t/tʃ], [ʃ/s], and [d/dʒ]. The naive subjects rated them in the following order: [b/v], [t/θ], [t/k], [ʃ/s], [t/tʃ], and [d/dʒ]. The order is the same except for the interchange of order of the [ʃ/s] and the [t/tʃ] substitutions. The mean rating of the sophisticated subjects' ratings of the [ʃ/s] passages was 4.37 compared to 5.45 by the naive subjects. The [ʃ/s] substitution like the other five was rated more defective by the naive subjects.

An ordering of the means of each of the sound-substitution positions for the ratings of both groups of subjects results in an array from least to most defective: sophisticated subjects--Mt, M, F, or Mi, and I: naive subjects--Mt, M, F, Mi, and I. The two groups of subjects rated the passages with the test consonant position varied, in the same rank order of severity.

An examination of Tables 6 and 7 reveals that phonetic context probably had little influence on perceived defectiveness in one passage relative to perceived defectiveness of that same passage when substitution position had been varied. If a sound substitution ([t/θ]) was rated more severely than some other substitution ([b/v]) in the same position (I), it tended to be rated more severely in the varying contexts of the other four positions (M, F, Mi, and Mt). The consistency of the relationships of these severity ratings during the varying of the phonetic context of the sound substitution lends support to the contention that in this particular experiment phonetic context had little, if any, consistent influence on subject ratings of overall articulation defectiveness.

Table 8 displays the difference between means of the sound sub-

Table 4.--Analysis of variance of the ratings by sophisticated subjects of 30 passages in which sound substitutions and sound substitution positions are varied within words or syllables

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test Ratio	Significance
Consonant Position	4	391.13	97.78	51.60	Yes*
Sound Substitution	5	1374.30	274.86	145.06	Yes*
Position X Substitution	20	386.63	19.33	10.20	Yes*
Within	1830	3467.58	1.89	..	..
Total	1859	5619.58	..	..	..

* Significance at the .01 level.

** Significance at the .05 level.

Table 5.--Analysis of variance of the ratings by naive subjects of 30 passages in which sound substitutions and sound substitution positions are varied within words or syllables

Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Test Ratio	Significance
Consonant Position	4	629.83	157.46	62.03	Yes*
Sound Substitution	5	2001.43	400.28	157.70	Yes*
Position X Substitution	20	458.83	22.94	9.04	Yes*
Within	1830	4645.10	2.54	..	..
Total	1859	7735.19	..	..	..

* Significance at the .01 level.

** Significance at the .05 level.

Table 6.--Mean ratings by sophisticated subjects of 30 passages in which sound substitution and sound substitution positions are varied within words or syllables

Sound Substitution	Sound Substitution Position					Average
	I	M	F	Mi	Mt	
t/k	4.90	3.80	4.31	4.74	2.43	4.03
f/s	5.02	4.51	3.89	4.32	4.13	4.37
b/v	3.03	1.61	1.73	2.03	1.51	1.98
t/e	3.90	3.96	3.92	4.08	3.32	3.83
d/dz	5.66	3.66	5.15	5.10	3.42	4.59
t/ts	4.06	4.91	4.82	3.56	3.34	4.14
Average	4.43	3.74	3.97	3.97	3.03	. .

Table 7.--Mean ratings by naive subjects of 30 passages in which sound substitutions and sound substitution positions are varied within words or syllables

Sound Substitution	Sound Substitution Position					Average
	I	M	F	Mi	Mt	
t/k	6.94	5.26	5.50	6.08	3.37	5.43
s/s	6.35	5.40	5.14	5.55	4.82	5.45
b/v	3.93	2.39	2.76	2.43	2.77	2.85
t/θ	5.84	4.95	5.39	5.71	4.40	5.26
d/dʒ	7.14	5.29	6.51	6.69	4.63	6.06
t/tʃ	5.31	6.35	6.30	5.27	4.81	5.61
Average	5.91	4.94	5.27	5.29	4.13	. .

stitutions in different positions as rated by both the sophisticated and the naive subjects. The significance of these differences was determined by application of Dunn's (1961) "C" Test. The significance of the differences between the various means was found to be the same for the two groups of subjects.

Where a significant difference between the means was found, there is justification for the inference from these data that the sound substitution positions being compared exerted differential effect on the subjects' judgments of articulation defectiveness. This is interpreted to indicate that the sound substitution positions are significantly different from each other in the magnitude of their effect on listener judgment of articulation defectiveness. Since other known variables were held constant, as previously described, it is believed that the sound position variable was responsible for listener evaluation of articulation defectiveness. Therefore, as distinguishable entities contributing to listener judgment of articulation defectiveness, the various sound positions showing significant differences should be differentially labeled.

If no significant difference between means was found, there is believed to be no justification for the inference from these data that the sound substitution positions being compared had a differential effect on the subjects' judgments of articulation defectiveness. This is interpreted to indicate that differential labeling of the sound substitution positions not found to differ significantly is probably not justified on the basis of these data. This is not an indication that these positions do not affect listener ratings of defectiveness. It is an indication that neither of the positions has an effect significantly greater than the other. Therefore, since these sound substitution positions are not distinguishable

Table 8.--Differences between means of subject ratings of the 30 passages with sound substitution positions varied

Sophisticated Subjects			Naive Subjects		
Means Compared	Difference	Significance	Means Compared	Difference	Significance
I and M	0.69	Yes*	I and M	0.97	Yes*
I and F	.46	No	I and F	.64	No
F and M	.23	No	F and M	.33	No
Mi and Mt	.94	Yes*	Mi and Mt	1.16	Yes*
I and Mi	.46	No	I and Mi	.62	No
F and Mt	.94	Yes*	F and Mt	1.14	Yes*
M and Mi+Mt	.24	No	M and Mi+Mt	.23	No
F and I+Mi	0.23	No	F and I+Mi	0.33	No
Mt and I+Mi	1.17	Yes*	Mt and I+Mi	1.47	Yes*

* Significance at the .01 level.

** Significance at the .05 level.

entities on the basis of the magnitude of their effect on listener judgment of articulation defectiveness in this study, they will not be differentially labeled.

The difference of the mean ratings of medial-initiating and medial-terminating positions was significant at the .01 level. This finding has pertinence in regard to the controversy over the validity of the "medial" concept. Since Mi and Mt are significantly different, there is justification for differential consideration and labeling. The unification of the two concepts into a single "medial" classification would seem inappropriate, then, because medial-initiating and medial-terminating positions exert differential influence on listener judgment of articulation defectiveness. Further, the finding that there is not a significant difference between judgments of medial substitutions and judgments for a combination of the medial-initiating and medial-terminating substitutions that comprise the medial substitutions would seem to indicate that maintenance of a classification that differentiates among M, Mi, and Mt is unjustified. Since the medial position is comprised of the two significantly different components the combined consideration of which will not differ significantly from the consideration of "medial" as an entity, there is apparent justification for abandoning the consideration of a medial position when substitutions are being evaluated.

On the basis of listener evaluation of articulation it is appropriate to distinguish between syllable-initiating and syllable-terminating sound substitutions that occur medially within a word. The appropriateness of extending this distinction to those syllable-initiating and syllable-terminating positions that initiate and terminate words is of concern.

From Table 8 it can be determined that a significant difference does not exist between articulation defectiveness ratings for substitutions

in the initial positions of words and for those in the initial position of syllables that do not initiate words. On the basis of these data there is not sufficient evidence to justify the retention of the distinction between sound substitutions that initiate syllables and those that initiate words. The practical implication of this inference is to use one referent for both positions until future research provides evidence of the need to make this distinction. Since "initial" has been traditionally used to refer to the initial position of the word, it does not adequately extend to cover medial-initiating positions. "Syllable-initiating" or "Si" does, however, adequately refer to both word-initiating and syllable-initiating positions between which no significant difference was found on the basis of listener evaluation of defective articulation.

The difference between ratings of passages with the sound substitution in the final position and the ratings of passages with the substitution terminating a syllable, other than the final one in a word, is shown in Table 8 to be significant at the .01 level. From these data there is justification for the inference that sound substitutions in these positions exert differential effect on listener judgments of articulation defectiveness. On the basis of this inference, the decision to retain the distinction between "final position" with its traditional connotation and syllable-terminating position other than a final position seems appropriate.

Table 8 reveals that the difference between the means of final substitutions and the combined means of the ratings for initial substitutions and medial-initiating substitutions is not significantly different. Nor are the means for the initial substitutions and those for the final substitutions significantly different. This is contrary to what has frequently been considered by speech clinicians to be the case. Van Riper

and Irwin (1958, p. 7) suggested that the "errors probably are more noticeable when they occur in the initial positions of words or syllables than when they appear in the final position."

One of the hypotheses of this investigation was that if the average of the mean M ratings (which were ratings of five syllable-initiating and five syllable-terminating substitutions) did not lie half way between the average of the mean I ratings (which were ratings of 10 syllable-initiating substitutions) and the average of the mean F ratings (which were ratings of 10 syllable-terminating substitutions), the concept of a syllable-initiating and syllable-terminating classification would be invalid. However, the finding that Mt and F substitutions were significantly different revealed that M could probably not be expected to lie half way between I and F. Table 8 reveals that M was not significantly different from Mi+Mt. I was not significantly different from Mi. F, however, was significantly different from Mt, and Mt was smaller than either I or F (Table 7). Therefore, M could not lie half way between I and F as it would if syllable-initiating and syllable-terminating were adequate designations of consonant position.

CHAPTER IV

SOME CONCLUSIONS ABOUT CONSONANT POSITION

WITHIN WORDS AND SYLLABLES

Based on the 122 subjects' perception of articulation defectiveness in 30 recorded speech passages based on six consonant substitutions, the following conclusions have been made:

1. Neither the traditional classification of consonant positions as initial, medial or final nor the classification of consonant positions as syllable-initiating and syllable-terminating appear to be adequate.
2. There appears to be justification for abandoning the traditional concept that it is useful to consider consonants as "medial."
3. There appears to be justification for differential labeling of syllable-terminating and word-terminating positions.
4. Evidence was not found to justify the differential labeling of syllable-initiating and word-initiating positions.
5. A classification of consonant positions as syllable-initiating (Si), medial syllable-terminating (Mt), and word-terminating (F) appears to be appropriate.
6. Syllable-initiating consonant substitutions are perceived as being more defective than those syllable-terminating consonants that do not terminate words.
7. Syllable-initiating consonant substitutions are not perceived as being significantly more defective than word-terminating consonant substitutions.
8. Non-speech pathology majors rate consonant substitutions as being more defective than do speech-pathology majors.
9. Findings regarding consonant-substitution positions within words and syllables were highly consistent among non-speech-pathology majors and speech-pathology majors.

APPENDIX I

PASSAGES

Passage: 1-- t/k Correct

As an exercise for that cook and bake contest, Mary did make a picnic basket like the one on the cover of her cookbook. She took turkey sandwiches and cabbage slaw. She did bake a coconut-chocolate cake with caramel icing to incorporate with the liquid refreshment, percolated coffee or coke.

Passage: 2-- t/k Medial

As an etercise for that cook and bake contest, Mary did make a pitnic bastet like the one on the cover of her cootbook. She took turtey sandwiches and cabbage slaw. She did bake a cotonut-chotolate cake with caramel icing to intorporate with the litwid refreshment, pertolated coffee or coke.

Passage: 3-- t/^tk Correct

Little Chuck Birch sat crunching his chain watchband in church last Sunday. Launching a search for some enchantment for Chuck, Mrs. Birch matchlessly churned through her pouch. A watchful bachelor within the child's reach cheerfully exchanged without speech or reproach a rich chewy chocolate drop to squelch mischievous Chuck's encroachment.

Passage: 4-- t/t^s Initial

Little Tuck Birch sat crunching his tain watchband in turch last Sunday. Launching a search for some enchantment for Tuck, Mrs. Birch matchlessly turned through her pouch. A watchful bachelor within

the tild's reach teerfully exchanged without speech or reproach a rich tewy tocolate drop to squelch mischievous Tuck's encroachment.

Passage: 5-- d/dj Correct

Plunging into the garage, Judge George Jones did dislodge the large hedgecutters. He did emerge to the germain charges of Madge Jones who engineered the job of hedgerow surgery from her longechair. Jokesters did merge just beyond the hedge to jeer this authoritarian arrangement as wife indulgence and judge derangement.

Passage: 6-- d/dj Medial

Plunding into the garage Judge George Jones did dislodge the large hedcuttters. He did emerge to the germain charges of Madge Jones who endineered the job of hedrow surdery from her loundchair. Joksters did merge just beyond the hedge to jeer this authoritarian arrandment as wife induldence and judge derandment.

Passage: 7-- t/k Final

As an exercise for that coot and bate contest, Mary did mate a picnit basket lite the one on the cover of her cookboot. She toot turkey sandwiches and cabbage slaw. She did bate a coconut-chocolate cate with caramel icing to incorporate with the liquid refreshment, percolated coffee or cote.

Passage: 8-- t/k Initial

As an exercise for that took and bake tontest, Mary did make a picnic basket like the one on the tover of her tookbook. She took turkey sandwiches and tabbage slaw. She did bake a toconut-chocolate take with taramel icing to incorporate with the liquid refreshment, percolated toffee or toke.

Passage: 9-- t/tj Correct

From his porch armchair, cheerful Bachelor Birchley speechlessly researches life each morning. When questioned about his watchful enchantment, he chats with dispatch. Without the encroachment of his reproach, merchants, ranchers, churchgoers, and urchins charge for enrichment to the shops, hatchery, church, and his orchard providing richly a matchless picture of unchecked behavior.

Passage: 10-- t/tj Medial-terminating

From his porch armchair, cheerful Batelor Birtley speetlessly researches life each morning. When questioned about his wattful enchantment, he chats with dispatch. Without the encroachment of his reproach, merchants, ranchers, churtgoers, and urchins charge for enrishment to the shops, hattery, church and his orchard providing ritly a mattless picture of unchecked behavior.

Passage: 11-- t/e Correct

Thursday at the fourth monthly North Bertha Smith PTA meeting, thoughtful, enthusiastic Theodore Thurman, fifthgrade arithmetic teacher at South Smith School lectured on new mathematics theory. "Truthfully, it isn't myth that synthetic memorization of orthodox theory is strengthened by thorough thought exercises for youth," Thurman said on the thirteenth birthday of Smith.

Passage: 12-- t/e Initial

Trursday at the fourth monthly North Bertha Smith PTA Meeting, thoughtful, enthusiastic Teador Turman, fifth-grade arithmetic teacher at South Smith School lectured on new mathematics teory. "Truthfully, it isn't myth that synthetic memorization of orthodox teory is strengthened by torough tought exercises for youth," Turman said on the tirteenth birthday of Smith.

Passage: 13-- S/s Correct

Seeking to trace this certain unsung aspect of Alaskan settlement, this social agency once sent seven experimenters to discover the priceless details of the unselfish service of the Husky. This team urged congress to pass some measures supplying funds for a conserving of these dogs through sufficient virus control.

Passage: 14-- S/s Final

Seeking to trash this certain unsung aspect of Alaskan settlement, this social agency wonsh sent seven experimenters to discover the pricelesh details of the unselfish servish of the Husky. This team urged congresh to pash some measures supplying funds for a conserving of these dogs through sufficient virush control.

Passage: 15-- d/d3 Correct

A judge enjoined the hedgecutters' and hedgetrimmers' merger just today. The judge and a few disjoined objectors charge that the enlargement into an unjustified union of hedgecutters and hedgetrimmers will engender mismanagement of hedge surgery in Georgetown. The merger arrangement resulted largely from the surgeons' failure to guage the unjustified judgment.

Passage: 16-- d/d3 Medial-terminating

A judge enjoined the hedcutters' and hedtrimmers' merger just today. The judge and a few disjoined objectors charge that the lardment into an undustified union of hedcutters and hedtrimmers will engender mismanadment of hedge surgery in Geordtown. The merger arrandment resulted lardly from the surgeons' failure to guage the unjustified judgment.

Passage: 17-- d/d3 Final

Plunging into the garadu Jud Geordu Jones did dislodu the lardu hedgecutters. He did emerdu to the germain charges of Madu Jones who engineered the job of hedgrow surgery from her loungechair. Jokesters did merdu just beyond the hedu to jeer this authoritarian arrangement as wife indulgence and judu derangement.

Passage: 18-- b/v Correct

The villagers of Green Grove, Virginia, have invented a vital plan to improve their lively valley. The involvement of VIPs has led to their voluntarily advertising the twelve evening spots alive in that vicinity as a vacationer's marvel that everyone should rove to view the lively variety of adventure they crave.

Passage: 19-- b/v Final

The villagers ob Green Grobe, Virginia, habe invented a vital plan to improbe their lively valley. The involvement ob VIPs has led to their voluntarily advertising twelbe evening spots alibe in that vicinity as a vacationer's marvel that everyone should robe, to view the lively variety of adventure they crabe.

Passage: 20-- s/s Correct

Sandra Jensen was unanimously accepted by this congressional conservation agency as correspondent to Congress. To satisfy the persistent Senators who want answers to questions about various aspects of the agency's investigations, Sandra's job will be to disclose any observations or discoveries considered to illustrate significant progress due to conservation technique.

Passage: 21-- s/s Medial-initiating

Sandra Jenshen was unanimously acshepted by this congressional conservation agenshy as correspondent to Congress. To satisfy the

persistent Senators who want anshers to questions about various aspects of the agenshy's investigations, Sandra's job will be to disclose any obshervations or discoveries conshidered to illustrate significant progress due to conshervation technique.

Passage: 22-- b/v Medial

The villagers of Green Grove, Virginia, have inbented a vital plan to improve their libely valley. The inbolbement of VIPs has led to their voluntarily adbertising twelve ebening spots alive in that vicinity as a vacationer's marbel that eberyone should rove to view the libely variety of adbenture they crave.

Passage: 23-- s/s Initial

Sheeking to trace this shertain unsung aspect of Alaskan shetlement, this shocial agency once shent sheven experimenters to discover the priceless details of the unselfish shervice of the Husky. This team urged congress to pass shome measures shupplying funds for a conserving of these dogs through shufficient virus control.

Passage: 24-- s/s Medial-terminating

Sandra Jensen was unanimoshly accepted by this congressional conservation agency's correshpondent to Congress. To satsishfy the persishtent Senators who want answers to queshtions about various ashpects of the agency's inveshtigations, Sandra's job will be to dishclose any observations or dishcoveries considered to illushtrate significant progress due to conservation technique.

Passage: 25-- b/v Correct

Vernon Shively pulled the lovely velveteen sleeve suavely from his marvelous invention. Several heart specialists, invited to the evening unveiling, stood above the valvule. Shively explained invaluable improvements in every production procedure. He recommended

involvement of the valvule to resolve movement when surgery is not advised but a valve needs rest.

Passage: 26-- b/v Medial-initiating

Vernon Shively pulled the lovely velveteen sleeve suavely from his marvelous invention. Several heart specialists, invited to the evening unveiling, stood above the valvule. Shively explained invaluable improvements in every production procedure. He recommended involvement of the valvule to resolve movement when surgery is not advised but a valve needs rest.

Passage: 27-- t/θ Final

Thursday at the fourth monthly North Bertha Smit PTA Meeting, thoughtful, enthusiastic Theodore Thurman, fifth-grade arithmetic teacher at South Smit, lectured on new mathematics theory. "Truthfully, it isn't myt that synthetic memorization of orthodox theory is strengthened by thorough thought exercises for you," Thurman said on the thirteenth birthday of Smit.

Passage: 28-- b/v Medial-terminating

Vernon Shibely pulled the lobely velveteen sleeve suably from his marvelous invention. Seberal heart specialists, invited to the ebning unveiling, stood above the valvule. Shibely explained invaluable improbments in ebry production procedure. He recommended involbment of the valvule to resolve mobement when surgery is not advised but a valve needs rest.

Passage: 29-- t/θ Medial

Thursday at the fourth montly North Berta Smith PTA Meeting, thoughtful entusiastic Theodore Thurman, fifth-grade aritmetic teacher at South Smith lectured on new matematics theory. "Trutfully, it isn't

myth that syntetic memorization of ortodox theory is strengt_uened by thorough thought exercises for youth," Thurman said on the thirteenth birt_uday of Smith.

Passage: 30-- t/k Correct

Franklin Cook jumped from the oncoming taxi. Frank ran excitedly to Mrs. Cook to describe the significant attractions he had discovered during this exceedingly exciting experience at a circus. With incredible control and exclusive style Frank produced completely and incorrigibly the magic incorporated by the Magician Tusko Trickster in his convincing circus production.

Passage: 31-- t/k Medial-terminating

Frant_ulin Cook jumped from the oncoming tats_ui. Frank ran ets_uitedly to Mrs. Cook to describe the significant attrats_uhions he had discovered during this et_useedingly ets_uiting ets_uperience at a circus. With incredible control and ets_uclusive style Frank produced completely and incorrigibly the magic incorporated by the Magician Tusko Trit_uster in his convincing circus produt_ushion.

Passage: 32-- t/t) Medial-initiating

From his porch arm_utair, cheerful Bachelor Birchley speechlessly researt_ues life each morning. When question_ued about his watchful ent_uantment, he chats with dispatch. Without the encroachment of his reproach, mert_uants, rant_uers, churchgoers and ur_utins charge for enrichment to the shops, hatchery, church and his ort_uard providing richly a matchless pict_utture of unte_ucked behavior.

Passage: 33-- d/d3 Medial-initiating

A judge end_uined the hedgecutters' and hedgetrimmers' mer_uder just today. The judge and a few dis_udoined ob_uectors charge that the enlargement into an und_ustified union of hedgecutters and hedgetrimmers will end_uender mismanagement of hedge sur_udery in Georgetown. The mer_uder

arrangement resulted largely from the surdeons' failure to guage the undustified judgment.

Passage: 34-- s/s Medial

Seeking to trace this certain unshung ashpect of Alashkan settle-
ment, this social agenshy once sent seven ekshperimenters to dishcover
the prishless details of the unshelfish service of the Hushky. This
team urged congress to pass some measures supplying funds for a con-
sherving of these dogs through sufficient virus control.

Passage: 35-- t/k Medial-initiating

Franklin Cook jumped from the ontoming taxi. Frank ran excitedly
to Mrs. Cook to describe the signifitant attractions he had distovered
during this exceedingly exciting experience at a cirtus. With intred-
ible control and exclusive style Frank produced completely and intor-
rigibly the magic intorporated by the Magician TusTo Trickster in his
convincing cirtus production.

Passage: 36-- t/e Correct

That ethnic ghetto's thoroughly filthy, unhealthy conditions
smother the faithful workers' enthusiasm. Both unthankful, unthrifty
ethnocentricity and slothful theory cause unthought-of ruthless, wrathful
squandering of things that could, with forethought and forthright use,
alleviate some dearth. No bathrooms or toothbrushes grace the worthless
thatched lath huts. Unthinkable thievery and sloth enthrall nontheistic
inhabitants.

Passage: 37-- t/e Medial-terminating

That etnic ghetto's thoroughly filthy, unhealthy conditions
smother the faitful workers' enthusiasm. Both unthankful, unthrifty
etnocentricity and slotful theory cause unthought-of rutless, wratful

squandering of things that could, with forethought and forthright use, alleviate some dearth. No batrooms or toothbrushes grace the wortless thatched lath huts. Unthinkable thievery and sloth enthrall nontheistic inhabitants.

Passage: 38-- t/t) Medial

Little Chuck Birch sat crunting his chain watband in church last Sunday. Launting a search for some entantment for Chuck, Mrs. Birch matlessly churned through her pouch. A watful battelor within the child's reach cheerfully extanged without speech or reproach a rich chewy chocolate drop to squelch mistievous Chuck's encroatment.

Passage: 39-- t/t) Final

Little Chuck Birt sat crunching his watchband in churt last Sunday. Launching a seart for some enchantment for Chuck, Mrs. Birt matchlessly churned through her pout. A watchful bachelor within the child's reat cheerfully exchanged without speet or reproat a rit chewy chocolate drop to squelt mischievous Chuck's encroachment.

Passage: 40-- b/v Final

The billagers of Green Grove, Birginia, have invented a bital plan to improve their lively balley. The involvement of BIPs has led to their boluntarily advertising the twelve evening spots in that bicinity as a bacationer's marvel that everyone should rove to biew the lively bariety of adventure they crave.

Passage: 41-- t/e Medial-initiating

That ethnic ghetto's thoroughly filty, unhealty conditions smother the faithful workers' entusiasm. Both untankful, untrifty ethnocentricity and slothful theory cause untought-of ruthless, wrathful squandering of things that could, with foretought and forthright use,

alleviate some dearth. No bathrooms or toothbrushes grace the worthless thatched lath huts. Untinkable thievery and sloth entral nonteistic inhabitants.

Passage: 42-- d/d3 Initial

Plunging into the garage, Dudge Dorge Dones did dislodge the large hedgecutters. He did emerge to the dermain charges of Madge Dones who engineered the dob of hedgerow surgery from her loungechair. Dokesters did merge dust beyond the hedge to deer this authoritarian arrangement as wife indulgence and Dudge derangement.

APPENDIX II

INSTRUCTIONS FOR SUBJECTS

SET I: Preceded sample passages

This is a study in the scaling of articulation defectiveness. You are about to hear several passages. You are to listen carefully as several samples are presented a first time but do not write your rating until they are presented again later.

Please rate each of the following passages on the severity of its articulation defectiveness. Rate each passage on the nine-point equal-appearing-interval scale provided. A rating of 1 indicates normal articulation. A rating of 9 indicates unintelligibility. Rate articulation defectiveness only at the points 1, 2, 3, 4, 5, 6, 7, 8, or 9. Do not place any ratings between any of the nine points.

Each passage will be preceded by an announcement of its number; each passage will be followed by a short interval during which you would record your judgments. Make your judgments on the basis of each entire passage. You would record your judgment immediately after each passage is finished.

Not all passages contain defective articulation.

Listen now but do not record judgments for these sample passages.

SET II: Preceded test passages

Now please rate each of the following passages on the severity of its articulation defectiveness. Rate each passage on the nine-point

equal-appearing-interval scale provided. A rating of 1 indicates normal articulation. A rating of 9 indicates unintelligibility. Rate articulation defectiveness only at the points 1, 2, 3, 4, 5, 6, 7, 8, or 9. Do not place any ratings between any of the nine points.

Each passage will be preceded by an announcement of its number; each passage will be followed by a short interval during which you are to record your judgments. Make your judgments on the basis of each entire passage. Record your judgment immediately after each passage is finished.

Not all passages contain defective articulation.

Are there any questions?

APPENDIX III

ARTICULATION DEFECTIVENESS RATING SCALE

Name _____

Do you have a speech defect? _____

Year _____
(Fresh., Soph., etc.)

What kind of defect? _____

How much therapy have you had _____

Major _____

ARTICULATION DEFECTIVENESS RATING SCALES

Passage 1:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 2:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 3:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 4:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 5:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 6:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 7:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 8:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 9:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 10:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 11:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 12:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 13:	1	2	3	4	5	6	7	8	9
normal									unintelligible
Passage 14:	1	2	3	4	5	6	7	8	9
normal									unintelligible

BIBLIOGRAPHY

Books

- BERRY, MILDRED F. and EISENSON, J. Speech Disorders Principles and Practices. New York: Appleton-Century-Crofts, Inc. (1956).
- IRWIN, RUTH B. Speech and Hearing Therapy. Pittsburgh: Stanwix House, Inc. (1965).
- JOHNSON, W. and OTHERS. Speech Handicapped School Children. New York: Harper and Brothers Publishers (1956).
- MC DONALD, E. T. Articulation Testing and Treatment: A Sensory-Motor Approach. Pittsburgh: Stanwix House, Inc. (1964).
- NEMOY, E. and DAVIS, S. The Correction of Defective Consonant Sounds. Boston: Expression Co. (1937).
- STETSON, R. Motor Phonetics: A Study of Speech Movements in Action. Amsterdam: North-Holland Publishing Company (1951).
- VAN RIPER, C. Speech Correction Principles and Methods. Englewood Cliffs, N. J.: Prentice Hall (1963).
- VAN RIPER, C. and IRWIN, J. Voice and Articulation. Englewood Cliffs, N. J.: (1958).
- WEST, R., ANSBERRY, M., and CARR, ANNA. The Rehabilitation of Speech. New York: Harper and Row, Publishers (1957).

Articles

- BARKER, JANET O. A numerical measure of articulation. J. Speech Hearing Dis., 25, 79-89 (1960).
- _____, and ENGLAND, G. A measure of articulation: further developments. J. Speech Hearing Dis., 27, 23-27 (1962).
- CURTIS, J. Systematic research in experimental phonetics: 3. the case for dynamic analysis in acoustic phonetics. J. Speech Hearing Dis., 19, 147-157 (1954).
- DUNN, O. Multiple comparisons among means. J. of the Amer. Statistical Assoc., 56, 52-64 (1961).

- FRENCH, N., CARTER, C., JR., and KOENIG, W., JR. The words and sounds of telephone conversations. Bell Syst. Tech. J., 9, 290-324 (1930).
- JORDON, E. Articulation test measures and listener ratings of articulation defectiveness. J. Speech Hearing Res., 3, 303-319 (1960).
- KEENAN, J. What is medial position? J. Speech Hearing Dis., 26, 171-174 (1961).
- LEWIS, D. and SHERMAN, DOROTHY. Measuring the severity of stuttering. J. Speech Hearing Dis., 16, 320-326 (1951).
- MILISEN, R. The disorders of articulation: a systematic clinical and experimental approach. J. Speech Hearing Dis. Monogr. Suppl., 4, 6-17 (1954).
- MORRISON, SHEILA. Measuring the severity of articulation defectiveness. J. Speech Hearing Dis. 20, 347-351 (1955).
- PERRIN, ELINOR H. The rating of defective speech by trained and untrained observers. J. Speech Hearing Dis., 19, 48-51 (1954).
- PRATHER, ELIZABETH M. Scaling defectiveness of articulation by direct magnitude-estimation. J. Speech Hearing Res., 3, 380-392 (1960).
- ROE, VIVIAN and MILISEN, R. The effect of maturation upon defective articulation in elementary grades. J. Speech Hearing Dis., 7, 37-45 (1942).
- SHERMAN, DOROTHY. Influence of vowels on recognition of adjacent consonants. J. Speech Hearing Dis., 17, 198-212 (1952).
- _____. Reliability and utility of individual ratings of severity of audible characteristics of stuttering. J. Speech Hearing Dis., 20, 11-16 (1955).
- _____ and CULLINAN, W. Several procedures for scaling articulation. J. Speech Hearing Res., 3, 191-197 (1960).
- _____ and MOODIE, CATHERINE E. Four psychological scaling methods applied to articulation defectiveness. J. Speech Hearing Dis., 22, 698-706 (1957).
- _____ and MORRISON, SHEILA. Reliability of individual ratings of severity of defective articulation. J. Speech Hearing Dis., 20, 352-358 (1955).
- SPRIESTERBACH, D. and CURTIS J. Misarticulation and discrimination of speech sound. Quart. J. Spch. 37, 483-491 (1951).
- STITT, C. and HUNTINGTON, DOROTHY A. Reliability of judgments of articulation proficiency. J. Speech Hearing Res. 6, 49-56 (1963).

WOOD, K. Measurement of progress in the correction of articulatory speech defects. J. Speech Hearing Dis., 14, 171-174 (1949).

WRIGHT, H. Reliability of evaluations during basic articulation and stimulation testing. J. Speech Hearing Dis. Monogr. Suppl., 4, 19-27 (1954).