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DIFFERENCES IN MODALITY STRENGTHS OF NORMAL  
AND ARTICULATION IMPAIRED CHILDREN

A Thesis

by

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Submitted to the Graduate School  
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in partial fulfillment of the requirements for the degree of  
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December 1984

Major Department: Speech Pathology and Audiology

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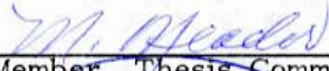
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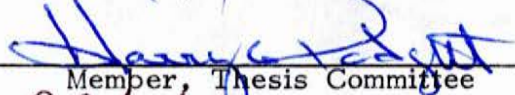
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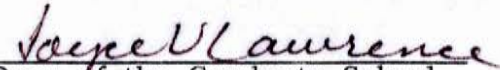
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Dean of the Graduate School

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## ABSTRACT

DIFFERENCES IN MODALITY STRENGTHS OF NORMAL AND  
ARTICULATION IMPAIRED CHILDREN. (December 1984)

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The goal of this investigation was to determine the difference in the modality strengths, auditory, visual, and kinesthetic, of children who had developed normal articulation and children with mild articulation impairments.

The study was conducted using forty-eight elementary school children as subjects. One group of twenty-four children had developed normal articulation. The other group of twenty-four children had mild articulation impairments. The two groups of children were matched individually on the variables of age and intellectual functioning. All forty-eight children were tested to determine their modality strengths.

A t-test was used to treat the data. The .05 level was used to determine the level of significance.

The analysis of the data revealed that there seems to be no significant difference between the modality strength of students with normal articulation and children with mild articulation impairments. For

both groups, the visual modality seems to be the strongest, the auditory modality second, and the kinesthetic modality third.

The findings suggest that a child's modality strength does not determine his articulation development. Therefore, other factors must affect the development of normal articulation in children.

To my husband, Daniel,  
for his love and constant encouragement.

## ACKNOWLEDGMENTS

I would like to thank my thesis committee for their time and expert guidance throughout this project.

A special thanks to my husband, family, and friends for their understanding and encouragement concerning this endeavor.

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## CHAPTER 1

### Introduction

In recent years, educators have focused their attention and research on teaching children through the children's modality strengths. For example, Wepman (1971) states that children who are having difficulty learning should be given tests to determine modality preference. Then, instructional materials should be used which emphasize the modality strength. However, very little research has been done to determine the differences in modality strengths of children who learn a task such as speech without difficulty and children who have difficulty. In learning speech, the modality strength of the child could be a factor in the development of articulation skills.

### Statement of the Problem

The goal of this investigation was to determine the difference in modality strengths of normal children and children with articulation impairments. Specifically, the investigation sought to determine the differences in the modality strength of children who had developed normal articulation and children with mild articulation impairments.

### Significance of the Problem

Speech pathologists have often wondered why some children learn to articulate sounds correctly, while others do not, even though no organic basis for the problem can be identified. Some researchers



believe that a child's modality strength may affect the ability to discriminate and articulate the various speech sounds correctly. For example, Johnson (1980:49) states that

deficiencies in the multicomponent sensor unit may interfere with both the acquisition and maintenance of articulation skills. Of course the degree and particular type of articulation impairment manifest will be somewhat contingent upon the particular sensor mechanism involved ...

The few studies available in the area of articulation and learning modalities have dealt with modality deficit instead of modality strength, and generally, they have focused on only one or two modalities instead of all three. Many of these studies involved either children or adults with normal articulation or impaired articulation but did not include both groups in the same study.

Further research into the effects of modality strength in children with normal articulation and children with impaired articulation may help speech clinicians plan more effective therapy and generate more precise prognoses for their therapy programs.

#### Statement of the Hypotheses

To deal with this subject, the hypotheses are stated in the null form.

#### Major Null Hypothesis

There is no significant difference in the modality strength (auditory, visual, and kinesthetic) of groups of students grouped according to their articulation skills.

### Null Subhypotheses

The major hypothesis is subdivided into three null subhypotheses.

Null subhypothesis one. There is no significant difference in the modality strength (auditory, visual, and kinesthetic) of students with normal articulation.

Null subhypothesis two. There is no significant difference in the modality strength (auditory, visual, and kinesthetic) of students with mild articulation impairments.

Null subhypothesis three. There is no significant difference in the distribution of modality strengths of normal students and students with mild articulation impairments.

### Assumptions and Limitations

The following are the assumptions and limitations of this study.

#### Assumptions

The following assumptions were made in this study:

Assumption one. That the researcher, a practicing speech, language and hearing clinician, was qualified to administer, score, and interpret all testing procedures used in this study.

Assumption two. That the groups of articulation normal and articulation impaired children were matched on relevant variables affecting articulation: age and intellectual ability.

Assumption three. That the instruments used to measure articulation, modality strength, and intellectual functioning, were, in fact, measuring these elements.

Assumption four. That the sex of the subjects did not affect the modality strength.

### Limitations

The following limitations were noted in this study:

Limitation one. To the extent that subjects were not representative of the articulation normal or articulation impaired population at large, results can not be generalized beyond the sample investigated or a like sample.

Limitation two. To the extent that knowledge of the subject status affected the objectivity of the researcher's observations, or caused her to influence the children's responses, the results might be biased in favor of one group or another.

### Definitions of Terms

#### Articulation Normal Children

Articulation normal children are those children who have no articulation errors or have age-appropriate articulation.

#### Articulation Impaired Children

Articulation impaired children are those children who exhibit articulation errors which are not appropriate for their age.



### Mild Articulation Impairments

For the purpose of this study, a mild articulation impairment is defined as an impairment which yields a score between 85 percent and 99.5 percent on the Arizona Articulation Proficiency Scale (Fudala, 1970).

### Modality Strength

A modality strength is the channel "through which information is processed most efficiently" (Barbe and Swassing, 1979b:6).

### Auditory Modality

A modality strength is the channel through which information is heard and retained (Barbe and Swassing, 1979b).

### Visual Modality

The visual modality is the channel through which information is seen and retained (Barbe and Swassing, 1979b).

### Kinesthetic Modality

The kinesthetic modality is the channel through which large and small muscle movements are felt and sensed (Barbe and Swassing, 1979b).

## CHAPTER 2

### Review of Literature

The review of literature will be divided into four sections: (a) modality testing; (b) the visual modality; (c) the auditory modality; (d) the kinesthetic modality.

#### Modality Testing

Modality testing is a means of identifying the channel through which a child gains information most effectively and learns most efficiently. These channels are the auditory, the visual, and the kinesthetic modalities.

Testing for modality strengths has been conducted since the eighteenth century. Barbe and Swassing (1979b) report that early attempts at modality testing were by way of observation. Rousseau, Condillac, and Montessori observed children to determine how most efficient learning occurred. Later, modality testing made use of crude instruments such as that used by Sequin (Barbe and Swassing, 1979b).

In the late 1960s and the 1970s, more extensive tests were developed by Kirk, Mills, Dunn and Dunn, and Dechant and Smith (Barbe and Swassing, 1979b).

Modality testing is carried out to determine the effectiveness of learning modalities in children, so that they can be taught through the most efficient channel (Barbe and Swassing, 1979b). To emphasize this point, Dunn and Dunn (1979) state that even children who are

motivated and ready to learn will learn most efficiently if taught through their strongest modalities.

### The Visual Modality

Little research has been done to determine the effects of the visual modality on the learning of articulation skills. However, Weiss, Lillywhite, and Gordon (1980:83) believe that "since formation of one-third of the speech sounds is visible, inability to see them could cause a delay in their acquisition." Powers (1971) says that the little research that has been done shows a higher incidence of articulation errors in blind people.

Jan, Freeman, and Scott (1977) agree that there are more speech problems in the blind population. However, they contend that the poor articulation may be a result of neurological disabilities rather than visual acuity deficit. They state that the evidence is inconclusive as to whether or not blind children who have no neurological disabilities have more articulation disorders than sighted children. The authors also state that the taped speech of blind and sighted children cannot be differentiated. They believe that sight is not necessary in the acquisition of speech and that blind children can acquire normal articulation even though in many cases acquisition may be delayed. Jan, Freeman, and Scott (1977:115) quote E.M. Rowe (1958) who says that "the degree of visual impairment has not been shown to be positively correlated with speech and language difficulties, which indicates that blindness alone is not the decisive factor." Bauman's



(1972) research suggests that blind children do not have a higher incidence of speech defects than sighted people.

Due to the paucity of data in the area of articulation and the role of the visual modality, no conclusions have been reached concerning the effects of the visual modality on articulation development.

### The Auditory Modality

The importance of the auditory modality on articulation skill development has been discussed by numerous researchers. Mysak (1966) states that in addition to functioning as a speech receptor, the auditory system also functions as a speech control system.

Other researchers describe the effects of auditory system function on articulation development. For example, Joseph Wepman (1971) says that as the auditory channel develops, children begin to use words and sounds more intelligibly. Van Riper (1958) believes that the sensory channel used for monitoring may change with age and speech development, and he suggests that children rely on the auditory channel when first learning a sound system. Van Riper (1971) also notes that auditory masking seems to be most disruptive to articulation during acquisition of these skills.

Other research into the effects of auditory feedback masking on articulation skills include a study by Yanez, Siegel, Garber, and Wellen (1982). This study revealed that children who were in the maintenance stage of therapy for /s/ misarticulations rely heavily on auditory feedback for correct articulation. The study showed that s-noise (high pass 2000 Hz) caused the most interference when children attempted to

produce the /s/ phoneme. Yanez et al. (1982), in the same study, determined that s-noise and r-noise (low pass 1250 Hz) interfered equally with articulation of the /r/ phoneme. These results suggest that auditory feedback does not serve these two groups in the same way and that articulation of /r/ is "subject to a greater range of auditory interference than /s/" (Yanez, et al., 1982:152). Yanez also found that r- and s-noise induced more articulation errors than quiet conditions. The s-noise induced significantly more errors than the r-noise.

Manning, Louko, and DiSalvo (1978) studied the articulation of children under the effects of binaural and monaural auditory feedback masking. They found that articulation was affected under the conditions of binaural and monaural right-ear masking. However, monaural left-ear masking produced no significant effects on articulation.

Some researchers have noted that the auditory channel monitors such aspects as rate, pitch, and quality of speech instead of articulation. McCroskey (1958) concluded from two experiments that auditory feedback monitored the duration and rate of speech. Johnson (1980) cites researchers who have suggested that the auditory channel functions to control vowel quality, pitch, and nasality.

Research conducted on the articulation skills of the congenitally deaf revealed that vowels are often misarticulated (Angelocci, Knopp, Holbrook, 1965). Another study conducted by Hudgins and Numbers (1942) showed that the number of articulation and rhythm errors

increased with the degree of hearing loss. Furthermore, the older pupils made more consonant errors than the younger pupils. One explanation might be that the older pupils' speech was inferior from the outset.

The articulation skills of deafened individuals reveal information concerning the auditory system's influence on speech production. Calvert and Silverman (1975:46) state that since speech production remains normal for some time after an adult or older child experiences a sudden loss of hearing, it is suggested that persons with normal hearing develop "a system of tactile-kinesthetic speech patterns" at an unconscious level and an auditory system monitors on a more conscious level. Without the auditory system, the speech of a deaf person will eventually deteriorate beginning with the /s/ phoneme which has very little kinesthetic feedback.

The articulation of a five and one-half year old boy with sudden hearing loss due to meningitis was studied by Binnie, Daniloff, and Buckingham (1982). Intelligibility of his speech was immediately affected. However, there were differences in his speech and the speech of congenitally deaf children. For example, he omitted very few consonants, syllables, and segmental slots. He also diphthongized vowels and syllabified clusters more frequently than deaf children and nasalized speech in a phonetically predictable manner. Binnie, Daniloff, and Buckingham (1982:188) speculate that these differences "represent his efforts to maximize interoceptive feedback and to slow the tempo of movement in an effort to maintain articulatory control." In other



words, the child tried to compensate for the lack of auditory signals by using kinesthetic signals.

Hartbauer (1975) seems to agree with this speculation when stating that kinesthetic sensitivity is heightened with hearing loss and therefore articulation skills should not necessarily deteriorate. Hartbauer also states that the hearing handicapped compensate for deafness by using vision to interpret inflections and pitches.

The results of these studies suggest that the effects of the auditory channel on articulation are not fully understood.

#### The Kinesthetic Modality

The kinesthetic modality refers to large and small muscle movements as well as the sense of touch (Barbe and Swassing, 1979b). The effects of the kinesthetic modality on articulation skills have been studied by many researchers. Van Riper (1958) suggests that the auditory channel facilitates learning of speech sounds while the kinesthetic modality monitors the movements of the learned sounds. Johnson (1980) states that some researchers believe that the kinesthetic channel monitors the production and accuracy of the consonant sounds.

The task of oral form recognition has often been used to attempt to determine the effects of the kinesthetic modality on articulation. Arndt, Elbert, and Shelton (1970) found no significant relationship between oral form recognition and articulation performance in a third grade population. McNutt (1977) found that children who misarticulated /s/ did as well as normal speakers on oral form recognition tasks.

However, other studies have found differences in oral form recognition in normal speakers and articulation impaired groups. In the study cited earlier, McNutt (1977) found that children who misarticulated /r/ did not perform as well on oral form recognition tasks as normal speakers. Ringel, House, Burk, Bolinsky, and Scott (1970) found that the oral form recognition ability of normal speaking adults was different from that of articulation impaired adults. Ringel, Burk, and Scott (1968) also found that there is a positive relationship between the severity of the articulation defect and the degree of impairment in the oral form recognition task.

In some studies, normal kinesthetic feedback is altered in order to determine the effects of the kinesthetic modality on articulation. Klein (1963) found that disturbance of tactile feedback, by use of anesthesia, caused articulatory changes. McCroskey (1958) found that anesthetizing the articulators produces a significant disturbance in articulation. Therefore, he concluded that the kinesthetic modality monitors articulation skills. Ringel and Steer (1963) conducted a study which showed that kinesthetic disturbance caused greater articulation change than did auditory feedback masking. A study conducted by Daniloff, Bishop, and Ringel (1977) using nerve block anesthesia showed a greater amount of phonemic errors in children than adults.

McCroskey, Corley, and Jackson (1959) found that oral sensory deprivation produces substitution errors in articulation more often than other articulatory defects. A study by Hardcastle (1975) using electropalatography and spectography showed minor articulation changes



induced by oral sensory nerve block. These changes usually consisted of a reduction of lip rounding and protrusion and distortions in tongue placement for fricatives and stops. Scott and Ringel (1971:804) found that oral sensory deprivation caused changes in articulation that were mostly nonphonemic also. The changes included "loss of retroflexion and liprounding gestures, less close fricative constrictions, and retracted place of articulation." Oral anesthetization studies conducted by Gammon, Smith, Daniloff, and Kim (1971:278) revealed that "the majority of mistakes occur as a result of changes from one manner or place to another rather than across such classes."

Because of criticism of research using nerve block anesthetization, Scott and Ringel (1971b) compared the speech of dysarthric speakers to that of speakers who were deprived of oral sensation in order to discern whether motor and sensory dysfunctions caused certain articulation patterns. Results of the study showed that the articulatory patterns of the two groups were different in stop and fricative error patterns. Thus, the results support the idea that peripheral oral receptors help to control articulation.

Jordan, Hardy, and Morris (1978) studied two groups of young males, one group with defective articulation and the other with normal articulation. On tongue placement tasks, oral anesthesia did not have a detrimental effect on the performance of either group. However, the group with normal articulation did perform significantly better than the group with defective articulation on several tasks. The normal articulation group made more correct tongue placements without visual

aids, performed the tongue placement tasks to criterion with fewer attempts, made more correct placements after the learning tasks, and repeated CV-syllables at faster rates than the group with poor articulation.

An interesting finding showed that the defective articulation group learned the tongue placement tasks to criterion with significantly fewer trials with anesthesia than without. Two interpretations were offered to explain these findings. The first interpretation was that the anesthetization did not affect the subjects' performances. The second interpretation was that they learned the task without the tactile cues that the groups with good articulation had used to learn the task. The first interpretation is more likely the valid one. Therefore, the difference in performance was due to learning which took place when the tasks were performed without anesthetization.

The study showed that the group with defective articulation had sufficient intraoral sensation to learn tongue placement tasks. However, the degree of efficiency with which the sensations were employed to learn the tasks is a question which remains unanswered.

From the results of these studies, it is apparent that the kinesthetic modality plays an important part in articulation skill development, but the magnitude of its effects remains to be determined.

To summarize, modality testing is performed to identify the sensory channel through which information is processed most efficiently. A number of studies have been conducted to determine the roles that auditory, visual, and kinesthetic modalities play in the acquisition of

articulation skills. These studies suggest that each of these modalities is important to articulation development. However, the degree of importance and the exact role of each of these modalities is not fully understood.



## CHAPTER 3

### Design of the Study

In this chapter, the subjects of the study, the procedures, the data-gathering instruments, and statistical treatment of the data will be discussed. A summary of the study will follow these discussions.

### Subjects of the Study

The subjects of the study were forty-eight kindergarten, first-, second-, and third-grade students in the Caldwell County School System in North Carolina. Twenty-four students had developed normal articulation skills, and twenty-four students were diagnosed by a certified speech pathologist as articulation impaired.

The groups of children with normal articulation and impaired articulation were matched individually on the variables of age and intellectual functioning. They were matched on age within three months. They were matched on intellectual functioning within six intelligence quotient points.

### Procedures

This study involved the use of the following procedures. First, the articulation impaired children were selected according to scores on the Arizona Articulation Proficiency Scale (Fudala, 1970). Then, level of intellectual functioning was ascertained using the Slosson Intelligence Test (Slosson, 1977). Finally, hearing was tested using a Maico Model



MA-2B audiometer. Hearing was screened at 25dB at the following frequencies: 500Hz, 1000Hz, 2000Hz, and 4000Hz. Only those children who passed all frequencies were accepted for the study.

Next, children with normal articulation were tested for intellectual functioning and hearing acuity. Twenty-four of these children were matched on age and intellectual functioning and with the twenty-four articulation impaired children.

The last step involved testing all forty-eight children to determine their modality strengths using the Swassing-Barbe Modality Index (Swassing and Barbe, 1979a).

The data gathered were then subjected to the appropriate statistical treatment.

#### Data-gathering Instruments

In this study, three instruments were used to gather data.

#### Arizona Articulation Proficiency Scale (AAPS)

This test yields a score of articulation proficiency.

Description of the AAPS. The AAPS is a picture test consisting of 48 Picture Test Cards and a sentence repetition test. Each picture is on a separate card and represents a common object in a simple black and white drawing. The sentence test may be used with adults or older children who have at least a third-grade reading ability.

Administration of the AAPS. The AAPS is administered individually. The speech clinician shows the child each card and the child responds with the correct name of the object represented. The articulation errors are recorded on the Protocol Booklet or testing form. Vowels and consonants are tested in the same words. For the sentence test, the child or adult reads the sentences and the clinician records the errors.

Scoring of the AAPS. Scoring of this test involves several steps. First, errors are recorded in the appropriate Consonant Evaluation or Vowel Evaluation column. Then, the value of each error is circled. The Total Consonant Score is the total of all circled values in the Consonant Evaluation column. The Total Vowel Score is the total of all circled values in the Vowel Evaluation column. Then, these two scores are added to obtain the Total Sound Score. The AAPS Total Score is then derived by subtracting the Total Sound Score from 100.0. This gives the percentage of correct articulation.

Interpretation of scores. The AAPS Total Score is interpreted as the degree of articulatory proficiency.

Standardization of the AAPS. The AAPS Picture Test Cards were standardized on 7,000 children with mental ages ranging from two to 14 years. The children were from four public school systems in two states and from a number of pre-school programs.

Validity of the AAPS. The validity of the AAPS was tested by comparing ratings of defective speech samples of 46 children with their scores on the AAPS. A coefficient of correlation of .92 was obtained. This coefficient of correlation indicates that the AAPS does provide a valid measure of articulatory proficiency.

Reliability of the AAPS. Nineteen public school speech clinicians tested 105 children in a test-retest interval of one week. A reliability coefficient of .96 was obtained.

#### Swassing-Barbe Modality Index (SBMI)

This test yields three scores of modality strength: auditory, visual, and kinesthetic.

Description of the SBMI. The SBMI is a matching-to-sample task. The stimulus items are the shapes--circle, square, triangle, and heart. Testing is done in all three modalities with nine stimulus items in each subtest. The first item involves one shape and the last item involves nine shapes. The same stimuli are presented in each modality.

Administration of the SBMI. The SBMI is administered individually in about 15 to 20 minutes. The administrator sits next to the child on the side of the child's dominant hand. Testing begins with the visual items. The child is shown the first item and is told he will have to match it after being allowed to see it for ten seconds. When five or more shapes are shown in the sequence, time is increased to twenty seconds. Next, the auditory items are read aloud at the rate of one



shape per second. The kinesthetic items are then presented so that the child can feel them without visual cues. Testing is continued in each modality until errors are made in two consecutive sequences or until all the items have been completed.

Scoring the SBMI. The SBMI is scored by adding all item scores, the number of shapes correct in each sequence, for each modality. This yields the modality raw score. These three scores are added to get the total raw score. Then, the percentage each raw score represents is computed.

Interpretation of the SBMI. The percentage score interpretations are based on the difference of five points being an educationally relevant difference. The dominant modality is the one which is at least five percentage points greater than the other two modalities.

Standardization of the SBMI. The SBMI was standardized on 600 students from a large southern California elementary school district. The students were in grades kindergarten through six. The proportions of boys to girls, right-handed to left-handed, and blacks to whites were consistent with the national average. However, there were a large number of students of Hispanic origin in the sample.

Validity of the SBMI. No tests of criterion validity of the SBMI have been conducted. However, the face, construction, and indirect validity have been analyzed.



Reliability of the SBMI. The SBMI was given to students twice within a four-month period in order to determine its test-retest reliability. The reliability of the subtests ranges from .58 to .67, which is within acceptable limits. The coefficients of reproducibility for the subtests are all at least .90. The coefficients of scalability are all either near or over .60.

Slosson Intelligence Test (SIT)

This test yields an intelligence quotient score.

Description of the SIT. The SIT is an individual IQ screening test. It uses a question and answer format. The SIT yields valid IQ scores for ages four years to adult.

Administration of the SIT. The SIT is administered individually. The test can be administered and scored within 10 to 20 minutes depending upon the ability of the child. Testing can take place over several days, if it cannot be completed in one sitting.

To begin testing, the tester first reads the introductory remarks to the person being tested. Then, he begins testing at the point where he believes the child can answer "10 in a row" correctly. The highest level in the "10 in a row" series is called the Basal Age. Testing is continued until the child misses "10 in a row." Further instructions are included for administering the test to persons with handicaps.

Scoring of the SIT. The SIT is scored by placing a (+) on the score sheet to indicate a correct response or a (-) to indicate an incorrect response. The Basal Age is computed from the scores. Then, the Mental Age is computed by adding the Basal Age plus the additional credit earned by passing times above the Basal Age. Next, the IQ is obtained by dividing the Mental Age by the Chronological Age of the child.

Interpretation of scores. The IQ score obtained from the SIT indicates that person's ability to learn and understand. It is the relationship between a person's mental age and his chronological age.

Standardization of the SIT. The SIT was standardized on children and adults from urban and rural New York State. They were black, white, American Indian, gifted, and some were retarded. The only people not included were those who could not speak English.

Validity of the SIT. The SIT was found to be a valid screening test of IQ for ages four into adulthood. Concurrent validity is shown by high correlations with the Stanford Binet, Form L-M.

Reliability of the SIT. When administered to 139 individuals from age four to 50 years, a test-retest reliability coefficient of .97 was obtained.

#### Statistical Treatment

With these derived data, the statistical treatment used was the t-test. The .05 level was used to determine the level of significance.

### Summary

Forty-eight elementary school students from the Caldwell County School System were the subjects for the study. Twenty-four students had a mild articulation impairment. All students were matched on relevant variables. Then, they were tested on the Swassing-Barbe Modality Index. The collected data were subjected to t-test analysis.

## CHAPTER 4

### Analysis of Data

In this chapter, the analysis of the data is presented under the restatement of each null subhypothesis. The means and standard deviations of normal and articulation impaired groups on visual, auditory, and kinesthetic modalities are presented (see Table 1).

#### Null Subhypothesis One

There is no significant difference in the modality strength (auditory, visual, and kinesthetic) of students with normal articulation.

The null subhypothesis was rejected at the .05 level of significance for the visual-auditory pairings of modality strengths (see Table 2). The null subhypothesis was rejected at the .001 level of significance for the visual-kinesthetic pairing of modality strengths (see Table 2). The null subhypothesis was rejected at the .01 level of significance for the auditory-kinesthetic pairing of modality strengths (see Table 2).

For the pairing of the visual-auditory modalities, students showed a significantly greater visual modality strength than auditory modality strength. For the pairing of the visual-kinesthetic modalities, students showed a significantly greater visual modality strength than kinesthetic modality strength. For the pairing of the auditory-kinesthetic modalities, students showed a significantly greater auditory modality strength than kinesthetic modality strength.



Table 1  
Means and Standard Deviations for Normal and Articulation  
Impaired Groups on Visual, Auditory, and  
Kinesthetic Modalities

Group	Mean	Standard Deviation
Visual:		
Impaired Group	18.71	6.52
Normal Group	18.50	6.81
Auditory:		
Impaired Group	14.88	3.98
Normal Group	13.88	5.64
Kinesthetic:		
Impaired Group	11.83	4.60
Normal Group	10.38	4.60

Table 2  
Modality Strengths of  
Normal Students

Pairings of Modalities	df	t-ratio	Level of significance
Visual-Auditory	46	2.47	.05
Visual-Kinesthetic	46	5.30	.001
Auditory-Kinesthetic	46	2.80	.01

Overall, for the students with normal articulation the visual modality was the strongest modality, the auditory modality was second, and the kinesthetic modality was third.

#### Null Subhypothesis Two

There is no significant difference in the modality strength (auditory, visual, and kinesthetic) of students with mild articulation impairments.

The null subhypothesis was rejected at the .01 level of significance for the pairings of the visual-auditory modalities, the visual-kinesthetic modalities, and the auditory-kinesthetic modalities (see Table 3).

For the pairings of the visual-auditory modalities, students showed a significantly greater visual modality strength than auditory modality strength. For the pairing of the visual-kinesthetic modalities, students showed a significantly greater visual modality strength than kinesthetic modality strength. For the pairing of the auditory-kinesthetic modalities, students showed a significantly greater auditory modality strength than kinesthetic modality strength.

Overall, for the students with mild articulation impairments the visual modality was the strongest modality, the auditory modality was second, and the kinesthetic was third.

#### Null Subhypothesis Three

There is no significant difference in the distribution of modality strengths of normal students and students with mild articulation impairments.

Table 3  
Modality Strengths of Articulation  
Impaired Students

Pairings of Modalities	df	t-ratio	Level of significance
Visual-Auditory	46	2.67	.01
Visual-Kinesthetic	46	4.71	.01
Auditory - Kinesthetic	46	3.19	.01



The null subhypothesis was not rejected at the .05 level of significance (see Table 4). A t-ratio of .11 for the visual modality was found between normal and articulation impaired groups of students. Therefore, students with normal articulation who tended to have a visual modality strength were similar to articulation impaired students who had a visual modality strength. A t-ratio of .71 for the auditory modality was found between normal and articulation impaired groups (see Table 4). Students with normal articulation who had an auditory modality strength were similar to articulation impaired students who had an auditory modality strength. A t-ratio of 1.10 for the kinesthetic modality was found between normal and articulation impaired groups (see Table 4). Students who had a kinesthetic modality strength were similar to articulation impaired students who had a kinesthetic modality strength.

#### Summary

The analysis of the data reveals that for students with normal articulation and articulation impaired students the strongest learning modality appears to be visual. The auditory modality appears to be the second strongest and the kinesthetic modality third. There seems to be no significant difference between the modality strength of the students with normal articulation and articulation impaired students.

These findings indicate that the modality strength of a child does not play an important role in the child's articulation development, although the use of all three modalities is important in the development

Table 4  
t-Ratios for Normal and Articulation  
Impaired Groups

Variable	df	t-ratio	Level of significance
Visual	46	.11	NS
Auditory	46	.71	NS
Kinesthetic	46	1.10	NS

of normal articulation. As studies cited earlier have stated, if one or all of the learning modalities is deficient, articulation development will be hampered.



## CHAPTER 5

### Summary, Conclusions, and Recommendations

In this chapter, a summary and conclusions of the study are presented. A few recommendations are offered.

#### Summary of the Study

In this study, three subhypotheses were used stated in the null form.

#### Null Subhypothesis One

There is no significant difference in the modality strength (auditory, visual, and kinesthetic) of students with normal articulation.

#### Null Subhypothesis Two

There is no significant difference in the modality strength (auditory, visual, and kinesthetic) of students with mild articulation impairments.

#### Null Subhypothesis Three

There is no significant difference in the distribution of modality strengths of normal students and students with mild articulation impairments.

The subjects of the study were 48 children in grades K-3 in the Caldwell County School System in North Carolina. Twenty-four children had developed normal articulation skills and 24 had mild articulation impairments. The two groups of children were matched individually on



the variables of age and intellectual functioning. All 48 children were then tested to determine their modality strengths using the Swassing-Barbe Modality Index (Swassing and Barbe, 1979a).

A t-test was used to determine any significant difference between subgroups.

#### Summary of Results and Discussion

Null subhypothesis one was rejected at the .05, .001, and .01 levels of significance for visual-auditory, visual-kinesthetic, and auditory-kinesthetic pairings respectively. Null subhypothesis two was rejected at the .01 level of significance for all three pairings, visual-auditory, visual-kinesthetic, and auditory-kinesthetic. Null subhypothesis three was not rejected at the .05 level of significance. The data revealed that for the students with normal articulation and for the students with articulation impairments the visual modality was the strongest, the auditory modality was second, and the kinesthetic modality was third. There was no significant difference between the modality strengths of the students with normal articulation and the articulation impaired students.

The findings reveal that the modality strengths of these two groups of students did not affect their articulation development. Therefore, where there is no organic basis for articulation impairment other factors besides the child's modality strength must be affecting articulation development.

### Recommendations

The following recommendations are offered.

1. It is recommended that a replication study be performed using larger groups of students to check these findings.
2. It is recommended that groups of students with moderate and severe articulation impairments be used in further studies.
3. It is recommended that studies be performed to determine whether teaching articulation skills through the child's modality strength is more effective than traditional therapies.

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