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MODIFICATION OF AN ANTERIOR LISP USING MYOFUNCTIONAL
THERAPY AND TRADITIONAL SPEECH THERAPY TECHNIQUES

by

CHARLENE E. CLARK

A clinical research and demonstration project submitted
in partial fulfillment of the requirements for the
degree of

MASTER OF SCIENCE


in


Speech Communication: Emphasis In
Speech Pathology/Audiology


Portland State University
1977

TO THE PROGRAM IN THE SPEECH AND HEARING SCIENCES, DEPARTMENT
OF SPEECH COMMUNICATIONS:


The members of the Committee approve the research
demonstration project of Charlene E. Clark presented June 3,
1977.


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CHAPTER I

INTRODUCTION AND STATEMENT OF PURPOSE

Introduction

In recent years a great deal has been written about the relationship between lisping and tongue thrusting, and about the role of the speech pathologist in the correction of oral facial muscle imbalance and a deviate swallow. According to orthodontists, Proffit and Norton (1970), and Harvold (1970), tongue activity definitely can affect the form of the oral cavity; hence, the shape of the oral cavity must have some significance for speech performance. Those in the speech field generally agree sibilant sounds may be distorted by placing the tongue forward against or between the dentition (Fletcher et al., 1961; Perkins, 1971; Van Riper, 1972; and Hanson, 1974). Viewed from both the speech and the dental aspects, it becomes apparent the function of the tongue has some role of importance for both professions.

The tongue plays an important role in articulation, and is normally a very mobile structure. It participates in the production of speech sounds by channeling, impeding, and obstructing the breath stream as it passes through the mouth (Johnson, et al., 1963). Although there appears to be

variations in specific sound production deemed acceptable, there are certain tongue positions which result in defective or distorted sounds. The lingual alveolar sounds [t,d,n, and l], for example, may be misarticulated with the tongue tip in a dental or interdental position and still be heard as correct by all but the most discerning listener. If the sibilant sounds, especially the /s/ and /z/, are misarticulated with the tongue tip forward against or between the dentition, however, they may be noticeably distorted. Thus, tongue tip elevation and contact with the alveolar ridge are necessary and integral aspects of this phoneme production.

According to Darley (1964), in the English language mouth opening is not great during speech. Therefore, if there is evidence of nasal obstruction or history of prolonged mouth breathing due to sinusitis, asthma, polyps, or adenoids there also may be a lisp, the subject presumably having learned to resist the degree of mouth closure necessary for strong consonant articulation. Darley further states one should look for a mandibular thrust (which is indicative of poor swallowing habits) because this is sometimes associated with distorted sibilants. Malocclusions such as open bites and protrusions may cause defective or distorted fricative sounds. Hanson and Barrett (1974) state anterior open bites may occur as a result of abnormal tongue pressures, and some of these open bites may be accompanied by frontal lisping. Articulation, then, may

depend on good muscle function in the tongue and in the muscles of mastication which raise the mandible.

Most speech authorities agree articulation problems make up a greater part of the speech clinician's case load. Of these cases, the most common of all speech defects is the frontal lisp (Johnson et al., 1963; Jann, 1964; Subtelny et al., 1964; and Barrett, 1974). How to effectively treat the anterior lisp and the exact nature of the management program which insures the most effective carry-over are issues often debated.

Garliner (1974) contends the therapist should consider therapy to correct oro-facial muscle imbalance and the deviate swallow before any formalized speech management is initiated. Overstake, according to Hanson (1970), reported children using normal /s/ patterns after swallowing therapy. A sigmatism training technique to keep the tongue away from the incisors during speech reduced dental overjet, regardless of the tongue thrust swallow, as well as correcting the deviant articulation patterns, according to Stansell (1969). Many philosophies abound; few with supportive research. Therefore, the Joint Committee on Dentistry and Speech Pathology-Audiology urges increased research efforts in this area.

Van Riper (1972) says it is always necessary to have in mind an over-all treatment plan based on the unique problems of the client. In devising such a plan, one must first

take into account those causal factors which may prevent the acquisition of normal speech. Since speech function is superimposed upon the basic functions of the oral structure, it seems logical to assume that normal physiological functioning of the tissues is essential to the normal processes of speech. It would seem, by working on both the speech and the tongue thrust at the same time, one would reinforce the other so new muscle patterns would be established sooner, and better carry-over would occur in spontaneous speech. According to Jann (1972), in every speech management situation the desired end or final objective is the modification of behavior, and the elimination of an undesirable behavior. With lisps the end is to eliminate the distorted sibilant sounds.

Statement of Purpose

It was the purpose of this research project to compare a combined program of speech and myofunctional therapy for correcting an anterior lisp with a traditional speech approach and a myofunctional only approach.

The project sought to answer the following questions:

- 1) Which of the three methods will effect the greater change in articulatory patterns for the /s/ and /z/ phonemes? and
- 2) Will six weeks of intensive management cause any significant difference in a client's speech patterns?

Operational Definitions

For purposes of this study the following operational definitions will be utilized.

Myofunctional Therapy

Myofunctional therapy refers to muscle (myo) function, usually used in reference to oral muscle imbalance and a deviate swallow.

Oro-facial Muscles

The term oro-facial muscles refers to two groups of muscles: 1) the muscles of expression (of major importance in tongue thrust therapy are the orbicularis oris, mentalis, and buccinator muscles); and 2) the muscles of mastication, especially the temporalis and masseter muscles.

Open Bite

An open bite malocclusion refers to a failure of the upper and lower antagonist teeth to make any occlusal or incisal contact during habitual occlusion.

Mandibular Thrust

A mandibular thrust refers to a forward movement of the mandible during atypical swallowing. In normal swallowing the upper and lower jaws are occluded; there is no forward movement in the lower jaw.

Class I

Class I refers to an abnormal positioning of the anterior teeth (misalignment, jumbled, rotated) with a normal mesiodistal relationship between the mandible and maxilla.

Class II

A Class II refers to a malocclusion in which there is a retrusion of the mandible in relation to the maxilla.

Class III

A Class III refers to a malocclusion in which the mandible is protruded in relation to the maxilla.

CHAPTER II

REVIEW OF THE LITERATURE

History of Tongue Thrust

The history of "tongue thrusting" has been relatively brief and interesting in that much controversy has been aroused by both speech and dental personnel. Previous to 1960, according to Hanson (1974), all writing on the subject of abnormal swallowing was done by dentists, except for two Englishmen, Francis, a speech pathologist, and Gwynne-Evans, an otorhinolaryngologist. Although many researchers have written and studied the "tongue thrust syndrome," unresolved questions remain as to definition of the term "deviate swallow," and how does swallowing affect the dentition and speech.

The British and American literature on atypical deglutition seems in agreement that there is such an entity as an atypical swallow; however, the British orientation has been toward research and the American dentists, meanwhile, have shown a propensity toward clinical experimentation (Hanson, 1974).

Rix (1946), an English orthodontist, published a series of papers describing dental impairment consisting of protruding upper incisors and a high narrow palate, resulting

from what he called the "teeth apart" swallow. He reported certain similarities between atypical swallowing and the suckling of infants. From these similarities grew the concept of orofacial muscle imbalance as a residual behavior, or the product of a delay in muscular maturation. Rix further noted that lisps, without exception, were accompanied by abnormal swallowing.

Gwynne-Evans (1947) felt atypical swallowing was not abnormal behavior, but the persistence of infantile characteristics which typify an earlier stage of development. He was one of the first to suggest something might be done to correct atypical swallowing by use of an appliance called either the Andresen or monobloc appliance. The Andresen appliance was made of acrylic, and often had a shelf that fit between the upper and lower teeth. The appliance fit loosely in the mouth and was held in position by closing the teeth and lifting the tongue up. The aim of the appliance was to stimulate muscle action by setting up new reflexes, that of closing the teeth and lifting the tongue up during deglutition. The new muscle patterns would aid in maintaining normal occlusion. The appliance, however, failed to act as a stimulus, and new muscle patterns were not developed.

Gwynne-Evans (1954) later proposed two types of swallowing; one he called "visceral" and the other "somatic." He believed the oro-facial musculature occupied a functional position between these two systems. The muscles were under

cortical control in somatic activities such as speech and normal swallowing, but under control of lower centers of the nervous system in abnormal or visceral swallowing. Furthermore, he felt suckling, the nursing activity of the infant, was an inborn reflex, whereas sucking is acquired through a learning process at a later age. Sucking requires the creation of a negative intra-oral pressure, and the teeth must be in occlusion during the process. The lips and cheeks are used to enclose a nipple and restrain the tongue in infantile suckling. Those who retain the infantile swallowing pattern fail to develop what is normally thought of as adult behavior, and, additionally, they fail to develop the proper muscles for an adult swallowing pattern (Gwynne-Evans, 1954, 1956).

Several British researchers (Tulley, 1954; Ardran and Kemp, 1955) studied the muscle patterns during the swallowing process by using electromyography and cinefluorography. Tulley (1954) agreed with Gwynne-Evans that orofacial muscles were visceral muscles. He regarded speech and mature swallowing patterns as learned behavior, and it was his contention during the learning process faulty habits could be acquired. Tulley (1954) at one time felt swallowing behavior could only be retrained if the muscle patterns were already in the process of changing due to maturation. Later, (1956) he believed orthodontic correction of the occlusion would spontaneously correct faulty muscle patterns during swallow-

ing. In his myographic studies he found many adults who swallowed with teeth apart, but this abnormality generally was associated with malocclusion. He asserted normal swallowing should be accompanied by a firm molar contact (Tulley, 1956).

Of the American contributors to this area, Edward Angle (1855-1930) not only systemized orthodontics, but made observations on the relationship between malocclusion and what he termed "pernicious" habits such as lip and finger habits. He believed mouth breathing was the chief etiological factor in causing malocclusion, particularly the Class II, division 1 (anterior in protrusion). He was pessimistic in regard to orthodontic treatment for mouth breathing cases, and wrote that breaking this habit was greater than overcoming lip and finger habits. Correction of mouth breathing rested with the patient, and very few had sufficient persistence to overcome it, according to Angle.

One of the first to propose modification of oro-facial muscles was Alfred Rogers. In 1906 he suggested corrective exercises to develop tonicity and proper muscle function. He developed several types of bite plates and muscle exercisers, as well as a group of exercises for the facial muscles. Rogers is best known for his concept of muscles as "living orthodontic appliances" (Hanson, 1974).

During the 1940's little information in this field was published. It was noted, however, the orthodontist was not

always effecting the changes he had previously claimed. In 1950 Straub, an orthodontist, began lecturing to orthodontists about orthodontic relapse due to malfunction of the tongue. The sole etiological factor for relapse, said Straub, was bottle feeding. He employed speech therapists to teach his patients to swallow correctly. After lecturing extensively in the United States and abroad, Straub was successful in stirring up a portion of his profession. Courses on tongue thrust correction were given in his office, and Straub wrote for the Journal of American Orthodontics on the "Malfunction of the Tongue." He grouped abnormal patterns into classifications of types, and is best known for his sixteen exercises to correct tongue thrusting (Straub, 1960, 1961, 1962).

Ricketts (1968), an orthodontist, was interested in growth and development of the orthodontic patient. He stated that in twenty years of orthodontics, open bite cases with concomitant tongue problems constituted the most annoying cases in his clinical practice. Because of the tongue thrust, the open bite cases were difficult to treat at all levels (pre, active, and post) of treatment. Ricketts produced a movie, "Tongue Thrust: an Orthodontic and Speech Syndrome" (Ehrlich, 1970 and Barrett, 1974).

One of the first speech clinicians to be heard in this area was Robert Harrington from California. He, with the Janns from New York, was on the first panel that pre-

sented the "Oro-facial muscle pressure imbalance pattern" to the National Convention of the American Speech and Hearing Association in 1960. Harrington and Breinholt (1963) later published an article stating the three etiological factors causing tongue thrust were: 1) chronic nasal congestion; 2) thumb and finger sucking, encouraging improper use of facial musculature; and 3) faulty eating habits, involving insufficient mastication of a too soft diet or flushing of coarse foods into the stomach with "gulps" of liquid.

The remaining review of the literature will deal with the relationship between tongue thrust and the following areas: 1) development, 2) occlusion, and 3) speech. It is the intention of the writer to give both sides of the controversy, those who believe tongue thrust can and should be treated by professionals in both the speech and dental fields; and those who feel it should be in the realm of research until more empirical data has proven the validity of the diagnostic label "tongue thrust" or that myofunctional therapy produces significant and consistent changes in oral form or function.

Tongue Thrust and Development

According to Proffit and Mason (1975), a more anterior tongue position in young children is founded on several anatomic reasons that relate to growth and development of the head and neck. In their research they report the tongue

approaches maximum size at or near the age of eight years, while the mandible grows more slowly, tapering off to a plateau between eight and twelve years of age, and then undergoes pubertal and postpubertal growth. In some cases, the mandible has shown some growth as late as the twentieth year. If a consideration of tongue size and the mandible size is examined, there is a growth differential which leaves a large tongue in a small jaw at this stage of development. According to Hopkins (1967), the tongue size doubles between birth and eight years in length, breadth, and thickness. It is a natural tendency for the tongue to be positioned relatively high and forward in the oral cavity in the early years. When there is a small oral cavity and a large tongue, an anterior tongue positioning may be necessary for an adequate airway or may result from problems both in the nose and in the pharynx.

Proffit and Mason believe an adult swallow comes through a transition from the suckling infant swallow. They state, "In the infant, the jaws are apart with the tongue filling the space between the gum pads or the teeth, the lips are active in sucking movements, and the tongue is placed forward between the dental ridges in contact with the lower lip and beneath the nipple. Thus, the infant swallows with the tongue in a downward and forward position. As the child matures, increasing tongue movements are seen, but often the tongue-to-lower-lip apposition remains." In normal children

studied longitudinally, the typical adult swallow appeared somewhere between the ages of two and twelve years. Therefore, according to Proffit and Mason, a child with a tongue thrust swallow is most likely to be an individual who has not yet learned the adult pattern, not one who has somehow learned the wrong thing. A delay in this transition can be caused by thumb sucking, proliferation of adenoid tissue, chronic allergic conditions, and other nasal and respiratory ailments. These same conditions may lead to mouth breathing, which is contributory to a low and forward tongue position as well as a lower than normal mandibular rest position. If there is diminution in the amount of lymphoid tissue in the oropharynx and normal growth in the ramus of the mandible along with vertical growth of the bodies of the cervical vertebrae, there is an increase in the available space in the oropharynx. This allows the tongue to assume a more posterior resting position in the oral cavity; hence, a closer approximation of the dental arches. These cavity size increases are especially rapid around the time of puberty. Statistics from studies by Fletcher et al. (1961) and Hanson and Cohen (1973) support this type of growth and swallow pattern. Fletcher et al. reported 50% of children six years of age had a tongue thrust swallow, and this percentage declined to about 25% at age fifteen. In conclusion, Proffit and Mason state if lisping and tongue thrusting or malocclusion, or both, coexist before puberty,

they recommend that a speech clinician initiate speech therapy procedures in spite of concurrent problems. In those older children with speech problems who receive orthodontic treatment, it might be desirable to modify the anterior resting posture of the tongue with myofunctional therapy techniques. They state articulation therapy techniques also are helpful in repositioning the tongue tip posteriorly.

Proffit, Chastain, and Norton (1969), also studied the relationship between lingual function and dental arch development in growing children between the ages of five and eight years. They inserted an acrylic palatal plate with transducers located just lingual to the maxillary central incisors and bilaterally opposite the second deciduous molars, then recorded pressures in those areas (see Figure 1, page 16). They found pressures during swallowing for these children were similar to that observed in adults. There was no positive correlation between lateral pressure and arch width. Lingual pressure data showed two distinct patterns of lingual pressure against the anterior transducer for tongue thrusters. The pattern for one group showed little or no pressure, which was felt by the investigators to be associated with the teeth-apart, infantile type of swallow. The other group had very heavy pressure against the anterior transducer during swallowing, probably associated with anterior open-bites. This study came under criticism by

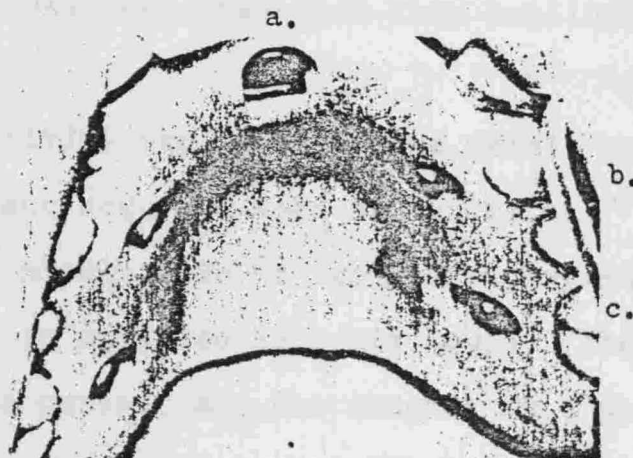


Figure 1. Miniature pressure sensing devices mounted in thin plastic palate-covering device, as used to study magnitude, duration, and pattern of tongue-palate contact (JADA, 1975).

- a. transducer lingual to central incisors in area of incisive papilla.
- b. transducer between cuspid and 1st. bicuspid.
- c. transducer between 2nd. bicuspid and 1st. molar.

Lear and Moorrees (1969) who pointed out that pressures involved in the swallow of liquids are much weaker than those involved in swallowing either saliva or solids. The data reported in Proffit et al. study was of children as they sipped water and swallowed upon command, which, as noted above, involves less pressures than swallows using solids or saliva.

Jann (1972) explains in more detail exactly what occurs when an infant acquires food by "suckling." As the infant presses the nipple with his tongue tip against the upper gum ridge, milk is squirted into his mouth. The lips, as noted earlier, are pursed, and the tongue, in a peristaltic squeezing action, pushes the milk back into the throat and down into the esophagus. The baby suckles, swallows, and breathes simultaneously. This suckling activity must be differentiated from sucking where a vacuum is created to draw liquid into the mouth. The latter is a more mature, learned activity. As a child matures, his teeth erupt, and his food is changed from liquid to solid, the suckling pattern with the tongue tip between the dental arches disappears. Solid food requires mastication, and the tongue is put to use maintaining the food in place between the posterior teeth. Jann has noted in a normal adult swallow pattern, after the food is thoroughly masticated, it is located on the dorsum of the tongue, which is elevated to the hard palate. The posterior teeth are brought into tight

occlusion, and the food is moved back into the oropharynx. At no time does the tip of the tongue thrust forward. During this process, the muscles of mastication are utilized while the facial muscles are relaxed.

Two other studies conducted with a primary age group in the early 1960s substantiated the idea that tongue thrust may be "normal" for children up to approximately age nine. Bell (1963) evaluated 353 five and six-year-olds. Of this number, 289 or 82% of the total population exhibited a low, forward tongue position with slightly depressed mandible during the act of swallowing. An older group, first through third grade, was evaluated by Ward et al. (1961). Their study also showed visceral swallowing as a typical method for swallowing at the age level of children in grades one to three. Further, Ward et al. reported the presence of visceral swallowing may be one of the complicating factors interfering with the normal development of tongue-tip phonemes. The forward tongue-tip placement in the production of the lingual alveolar sounds was characteristic of the majority of the group studied. This forward placement remains consistent from grades one through three, apparently not altering with maturational forces. They concluded their research indicated the emergence of a syndrome consisting of forward placement of tongue-tip sounds, tongue thrusting during the act of swallowing, and incipient malocclusion. It was their contention such a syndrome might contribute significantly to

the persistence of articulation variations, and in the determination of the appropriate age level at which to begin speech therapy.

Tongue Thrust and Orthodontics

Tongue thrust swallow, as stated earlier, was first noticed by orthodontists who were having difficulty treating certain types of malocclusion, such as protrusions and anterior open bites. The questions being asked then are still being asked today; they include: 1) Does form determine the function of muscles?; 2) Will muscles re-adapt after the form is changed?; and/or 3) Does the form depend on the musculature environment?

Subtelny (1970) studied a group of forty subjects, some with normal occlusion and some with protrusion or retrusions of the upper anteriors. Extensive records, high speed cineradiographs, cephalometric radiographs, dental study models, and clinical appraisals of swallowing were done on each subject. At the conclusion of the study, Subtelny stated an intimate relationship must logically exist between "form and function." Furthermore, he reported from all observations it seems aberrant form must be changed if the orthodontist hopes to change functional patterns. If the abnormal environment can be changed by the orthodontist, then changes in patterns of muscular function can be anticipated. Hanson (1974), in a review of Subtelny's research,

observed there was no evidence provided to substantiate Subtelny's conclusion that functional movements of orofacial musculature structures adapted to variable form of the oral environment.

Abrams (1963) used transducers and an impression technique to map the course of peri-oral muscles and record their relationship to the dentition. He found the tongue followed a consistent pattern in swallowing. A seal around the top of the mouth (the vault) was first formed by the lateral margins of the tongue followed by the anterior margin. The entire tongue was suddenly elevated against the palate, ejecting the food into the oral pharynx. The pressures exerted by the tongue increased with an increase in the viscosity of the food, while the pattern remained constant. His study of swallowing revealed the lips and cheeks, in contrast to the tongue, remained at rest during swallowing. They functioned only in sucking fluids or introducing solids into the mouth. He also gave considerable attention to the static pressures in the belief they may provide a more significant influence on the position of the teeth. The transducers were sensitive enough to measure the muscles used to maintain "negative intraoral pressure" but not sensitive enough to measure the resting postural drape of the tissues against the teeth. Therefore, he could draw no definite conclusions about pressures exerted by labial or buccal tissues. He noted when transducers are placed in the

mouth, there may be a disturbance in the simple proportionality between pressure and surface area.

Ehrlich (1970), in discussing tongue thrusting, observes no matter how much discussion, research, and controversy ensues relative to tongue thrusting, the practicing dentists are facing the "now" problem presented to them daily by patients which require treatment today. For these patients, she contends, prevention is already too late. Their need is for a means of correcting an immediate, currently existing problem. Ehrlich explains tongue thrust swallow is a disruption of nature's muscle balance for maintaining the alignment of the dentition. In a normal swallow the tongue is totally contained within the dental arches, while in an abnormal swallow pattern, the balance is upset because the tongue comes between the teeth, causing abnormal pressure. This, in turn, causes other orofacial muscles to function in an abnormal pattern in order to compensate for the deviation. She notes this abnormal pattern can cause or contribute to orthodontic relapse, as well as periodontal problems, and difficulty in wearing dentures. Finally, she argues, it is essential for each of the potential therapists to receive additional and specific training in the area of tongue thrust therapy so they might provide an important service to those patients the dentists feel require treatment.

A survey of the literature in the dental field would not be complete without mentioning the most radical of all

tongue-protrusion treatments, that of genioglossus muscle detachment. It has been observed by Kent (1973) that after maxillary and bimaxillary protrusions have been corrected by alveolar osteotomies, a significant difference in follow-up studies was noticed. According to Kent, those patients who had anterior mandibular osteotomies showed less regression when compared with patients for whom surgery was limited to the maxilla. An explanation for this was thought to be the relaxation of the genioglossus muscle, because of the distal displacement of its point of origin at the superior mental spine. Surgery, in this instance, involved primarily the detachment of the genioglossus muscle from the mandibular mental spine. The distal displacement reduced maximum protrusive tongue forces which might cause regressive tendencies. There were no adverse effects on speech or other tongue functions, nor was there any significant improvement of the existing malocclusion.

Tongue Thrust and Speech

Having reviewed the history and development of tongue thrust, the reviewer will now attend to what may be the "heart" of the problem for those in the speech field. Two questions arise in this area: 1) How does tongue thrusting affect speech?; and 2) Should the speech pathologist deal with it?

In response to the first question, Francis (1958) has

stated according to Dewey's (1950) frequency chart, [n,t,s,d, l,θ,ʒ] are some of the consonants occurring with greatest frequency in the English language. These frequently occurring consonants are normally articulated against the alveolar ridge behind the upper central incisors. Francis notes, however, that in certain malocclusions, the tongue thruster uses the upper incisor teeth instead of the alveolar ridge for articulating [t,d,n,l] , the /s/ and /z/ become interdental and the /θ/ and /ʒ/ tend to be defective in that the tongue is thrusting too far forward between the teeth. These misarticulations, then, may give rise to constant pressure on the upper teeth and it is assumed the pressure may either affect the position of the teeth or counter-act measures to effect a normal occlusion. In addition to the pressures against the dentition, the /s/ and /z/ may be heard as defective, therefore distorting the speech. Thus, Francis concludes tongue thrusting does affect speech and perhaps occlusion as well.

Perkins (1971) reports the effects of tongue thrust are of greater consequence dentally than for speech, although sibilant sound production is definitely not aided by this type of swallow pattern. If tongue thrusting persists much past age seven, it tends to offset the usual spontaneous correction of defective sibilants; thus, tongue thrusting does affect speech.

According to Fletcher et al. (1961), a normal adult swallow emerges from the relatively simple suckle-swallow of

the infant, and speech articulation emerges from the babbling-vocalizing of a young child. These learned behaviors are liable to irregularities which may allow basic bodily integrity, but might adversely affect overlaid or dependent functions. Tongue thrusting and associated speech distortions, two irregularities in the overlaid systems, were brought to the attention of speech specialists, especially by orthodontists, who found stresses from these produced negative effects in the treatment of certain types of malocclusion. The orthodontist turned to the speech specialist as a person most likely to have had training and experience in altering habit patterns related to use of the orofacial structures.

Fletcher et al. conducted a study to estimate the magnitude of the problem of tongue-thrust swallowing patterns and associated speech distortions, and to explore some of the practical implications. One of the conclusions, after studying 1615 children from six to eighteen years of age, was that the subject with a tongue-thrust swallow was much more likely to have associated sibilant distortion than was the subject without this pattern of swallowing. Although the literature suggests most children out-grow these habits, approximately 6% of those between eight and eighteen years of age continued to tongue-thrust swallow and distort the sibilant sounds. Hence, Fletcher et al. suggested the most advantageous approach to speech remediation might be first to

modify the swallowing pattern, then the pattern of speech articulation.

The tongue, according to Goda (1968), has two functions, one to assist swallowing and the other to assist speech. Learning proper tongue placement for only one of these activities is analogous to learning the motor skill of pitching a ball and being able to throw the ball to members of the infield but not to members of the outfield. He continues by saying, to be a pitcher, the child must be able to handle the ball in all situations. Similarly, tongue-tip elevation for production of certain consonant sounds can probably be ensured only if there is tongue-tip elevation during the swallowing as well. Goda goes on to say altered placement of the tongue-tip during articulation therapy can result in speech improvement, and altered placement of the tongue-tip during swallowing can reduce the pressure against the surface of the anterior teeth so the teeth may be able to grow correctly. Viewed in this totality, Goda feels the speech pathologist should be capable of handling the articulation and swallowing aspects associated with tongue thrusting.

Subtelny et al. (1964) states variable relationships exist between malocclusion, tongue thrust, and defective speech. It should be noted, however, in comparative analysis of radiographic data for the subjects in this study equated for degree and type of malocclusion and differentiated by speech, it was shown that speakers with defective articu-

lation of sibilant sounds fronted the tongue tip excessively.

In the literature dealing with speech, tongue thrusting is most often associated with articulation errors. Marge (1965), however, reported a case study of a laryngectomy patient with a tongue thrust. Any attempt to inject air into the esophagus by swallowing as prescribed in the usual manner resulted in a preliminary forward-pressing of the tongue related to his habitual pattern of deglutition. The patient not only had trouble with air injection, but, in the process, was continually dislodging his denture. After seven weeks of tongue therapy, a correct swallow pattern was utilized. The patient's voice production became louder, speech production became better synchronized with breathing activity resulting in a reduction of tracheal noise, and eating and swallowing activity became more satisfactory. The problem of dislodging dentures during swallowing was eliminated. Marge concluded more attention should be given to the patterns of deglutition possessed by the patient before stressing a technique of swallowing and releasing esophageal air, which is almost impossible for the laryngectomee with tongue-thrusting to incorporate.

In concluding a review of the literature, a few words relative to diagnosis of tongue thrusting will be discussed, for this, too, is controversial. Generally, tongue thrust was considered to be a swallowing pattern in which the tongue came forward against or between the dentition. This judg-

ment was often subjectively made by parting the lips at the moment of swallowing (i.e., Fletcher et al. 1961). Other diagnostic signs of tongue thrusting have been a facial grimace and lip puckering during swallowing, an over developed mentalis muscle, and the absence of masseter muscle strength as judged by direct palpation of the muscle during swallowing. Validity of these measures, other than the forward tongue movement, has been questioned by some researchers.

Rosenblum (1963) found in his study of normal swallowers some form of orofacial activity occurred in all of their swallows. This was revealed by using physiographic cinematography. Therefore, he concluded during deglutition, activity of the orofacial musculature may not necessarily be an indication of an "abnormal swallowing." Rosenblum's study affirmed, however, in normal subjects only a minimum amount of mentalis activity occurred during deglutition.

Ronson (1964), based on a study of sixty lispsers in the second, third, and fourth grades, has suggested visceral swallowing may occur with or without masseter contraction, especially in anterior open-bite cases. Hence, the lack of masseter contraction should not be used as a necessary criterion in diagnosing the visceral swallow.

A visual examination will only be accurate if the examiner notes the swallowing act at the instant he breaks the lip seal (Garliner, 1974). Thus, there is a possibility

of visual error. In the case of a closed-bite swallow, a visual examination will not show the deviate swallow. Payne, a dentist in California, originated an objective way to trace tongue patterns within the dentition. The Payne technique uses a fluorescent substance which clings to the tissue and can then be "black lighted" to reflect the tongue patterns of movement. Garliner and his colleagues, also, have found a way to objectively measure the strength of the obicularis oris muscle. This is done by using a button connected to a force scale.

In diagnosing tongue problems, Perkins (1971) notes there is a relationship between tongue mobility, lingual frenum size, and speech proficiency. Finally, in viewing this problem, some consideration must be given to the oral musculature at rest. Jann (1972) states there is a desirable posture of the face during rest. When the orofacial structure is not active or is static, the mandible is in a "physiological resting position." This is a postural reflex. The muscles of the jaw work against gravity and hold the mandible symmetrically posed with the cranium, and the teeth are closely approximated (although not in contact). This position, according to Jann, is a starting point for reflex movements of the mandible and oral musculature, such as suckling and swallowing, as well as chewing and speech, which are learned activities. In this position, the tongue is contained within the dental arches, the sides touching

their lingual surfaces, and the dorsum resting against the hard palate. The tip of the tongue is in contact with the alveolar ridge behind the upper incisors, and the lips are closed lightly. Breathing takes place through the nose.

Jann concludes by reminding the speech clinician a great deal can be learned by observing the client unobtrusively as he speaks and swallows.

Summary

In reviewing the literature, the viewpoints appear to cluster around two poles: the "believers" who think tongue thrusting should be treated; and the other, the "skeptics," who insist more research must be done to prove oral muscle patterns can be changed and will remain changed without remission.

Regardless of which side the speech clinician decides to choose, it would be well advised to heed Bloomer (1971). Those who undertake the diagnosis and treatment of abnormal patterns of oral behavior, he cautioned, should be very well informed about human growth and development. Furthermore, adequate diagnosis and treatment may require inter-disciplinary, professional consultation, and frequently justifies medical, dental, and speech cooperation in the treatment program.

CHAPTER III

METHODS AND PROCEDURES

In planning a program for modifying a deviate swallow with associated misarticulations (or deviant speech patterns), two principles must be considered: 1) muscles develop function only as a result of use and as muscles are used there is concomitant learning (Kephart, 1971), i.e., learning implies an acquisition of a skill through practice, training, and experience; and 2) the oral stage of swallowing is not bound in reflex; it is voluntary, and although it is usually unconscious, it may easily be called up to consciousness. It may be performed in an habitual manner, but habits can be modified. Even if it were the action of reflex, it could still be changed by altering one element in the reflex-arc to change the response (Barrett and Hanson, 1974).

Methods

Subjects

Three clients were selected to participate in this study. Each was seen for 30 minutes, twice weekly for a period of six weeks. Clients were chosen on the following basis: 1) nine-twelve years of age; 2) interdentalized /s/ and /z/ phonemes; 3) demonstrated oral facial muscle imbalance and a deviate swallow; 4) displayed a Class I

malocclusion; 5) demonstrated hearing acuity of 20 dB or less based on a puretone audiometric screening test for the frequencies of 500, 1000, 2000, 4000 and 8000 Hz.; 6) displayed no known disability which might be a significant contributing factor to an articulation or swallowing problem, such as enlarged or infected tonsils and adenoids, based on medical information reported by the parents (see Appendix A for form); 7) was willing to do homework assignments; and 8) had not received previous management for the speech or deviate swallow problems.

Selection Criteria

Deviant sibilant sounds will be those in which /θ/ or /ʃ/ are substituted for the /s/ or /z/, respectively, at least 50% of the time on the McDonald Deep Test of Articulation (1964).

The deviate swallow will be determined by use of the Payne Technique (to be explained under measurement instruments). Other oral facial muscles will be judged by using the force scale for the obicularis oris muscle (to be explained under measurement instruments), and by using a subjective judgment for the strength of the masseter and mentalis muscles (oro-facial muscle measurement explained under measurement instruments).

Occlusion will be determined by using Angle's classification for Class I malocclusion (occlusion explained under operational definitions).

Measurement Instruments

Measurement instruments to be used in this investigation are described below.

McDonald's Deep Test of Articulation (1964). In this test pairs of pictures or written sentences are used to elicit the production of a sound in many different phonetic contexts. Clinician will employ the appropriate combination of pictures or list of sentences to elicit the sound in approximately 30 different contexts in which the test sound comes before the context sound, and in approximately 30 different contexts in which the test sound comes after the context sound (see Appendix B for test form).

The Payne Technique. Orabase (brand name) with fluorescein is placed on the tip and lateral borders of the tongue. The client is then asked to swallow. The opaque substance clings to the area which the tongue touches. "Black light" is then reflected into the oral cavity, and the focal point of force initiated by the tongue is then easily demonstrated. For this study, the markings must appear on the upper anterior teeth, the upper and lower anterior teeth, or not appear anteriorly at all as the tongue moves forward between the anterior teeth during swallowing. The lateral markings shall appear in the first bicuspid area or forward against the dentition. In normal swallowing the anterior marking should appear in the area of the incisive papilla and the lateral markings should be against the alveolar ridge

in the area of the bicuspid (see Appendix C for chart of various markings).

The Force Scale. A button one inch in diameter is placed between the lips with a protruding string. The string is put into the hook of the force scale. The force scale is pulled until client is forced to release the button. A reading is then obtained on the scale. Three to five pounds of lip strength is considered to be indicative of normal oro-facial balance (Garliner, 1974) (see Appendix D for picture of force scale).

Other Oro-Facial Muscle Measurements. Masseter action will be rated by the clinician palpating (placing hands on client's face near the angle of the jaw) the masseter muscle during swallowing. The muscle will be subjectively ranked as strong, average, or weak. Use of the mentalis muscle will be noted during the act of swallowing and subjectively rated as normal or over-developed.

Procedures

The parents of each client were sent a letter explaining the research project (see Appendix E for sample letter), and also were asked to fill out the Home Checklist and return it to the clinician (see Appendix F for Home Checklist). The clinician filled out the consultation form before and after the management program (see Appendix G for the consultation form). Prior to intervention, Polaroid pictures were

taken of each client in the following positions: 1) in normal occlusion, 2) during swallowing, and 3) during the production of a sustained /s/ sound (see Appendices H, I, and J for photographs of clients A, B, and C, respectively). These were not retaken at the conclusion of treatment because, after intervention, it was felt by this investigator the client would tend to pose with correct tongue positioning for swallowing and /s/ production.

The number of errors made on the McDonald Deep Test of Articulation was used as a baseline (or pre-test) from which to measure improvement at the end of six weeks of therapy. As part of the post-test measures, the clients, in addition to the McDonald Deep Test of Articulation, were also given sentences selected by the research committee. Each client was randomly assigned to one of three management programs: a traditional articulation program (Management Program A), a myofunctional program (Management Program B), or a combined articulation and myofunctional program (Management Program C). The programs proceeded as follows:

Management Program A

Level 1

- Objective:
1. To correct tongue placement for /s/ by placing tongue in position for /t/ and lightly blowing air across tip of tongue, 20/20 times modeled/unmodeled.
 2. To prolong /s/ plus vowel in broken syllable, 20/20 times modeled/unmodeled.
 3. To produce /s/ plus vowel in syllables, 20/20 times modeled/unmodeled.

Procedure: 1. Clinician will instruct client to say /t/,

repeat and hold tongue in /t/ position without making sound, approximate jaw, and blow lightly (airstream directed forward between upper centrals and direction of air-flow checked by using a straw).

2. Clinician will instruct client to sustain /s/ and add vowel. Clinician will model broken syllables.
3. Clinician will instruct client to produce /s/ syllables.
4. Clinician will give homework assignment¹ (see Appendix K for sample home assignment worksheet).

- Homework:
1. Practice the /s/ sound 20 times daily.
 2. Practice /s/ broken syllables 10 times daily.
 3. Practice /s/ syllables 10 times daily.

Level 2

- Objective:
1. To demonstrate correct tongue placement for production of /s/.
 2. To produce /s/ 15/15 times unmodeled.
 3. To produce /s/ broken syllables 15/15 times unmodeled.
 4. To produce /s/ syllables 15/15 times unmodeled.
 5. To produce /s/ in initial position in words 20/20 times modeled/unmodeled.

- Procedure:
1. Clinician will ask client to produce /s/ in isolation, in broken syllables and in syllables (initial position).
 2. Clinician will model /s/ words (initial position).

- Homework:
1. Practice /s/ 15 times daily.
 2. Practice /s/ syllables 10 times daily.
 3. Practice /s/ words 10 times daily.

Level 3

- Objective:
1. To produce /s/ in syllables 15/15 times unmodeled.
 2. To produce /s/ in words 20/20 times unmodeled.
 3. To produce /s/ final position in broken syllables 10/10 times modeled/unmodeled.
 4. To produce /s/ final position in syllables 20/20 times modeled/unmodeled.

¹Homework assignment was contingent upon meeting criteria during management session at that level. This contingency was true for all homework assignments in each of the three management programs.

- Procedure:
1. Clinician will ask client to produce /s/ in isolation, in syllables and words in initial position.
 2. Clinician will model /s/ broken syllables (final position).
 3. Clinician will model /s/ syllables (final position).

- Homework:
1. Practice /s/ initial position syllables 5 times daily.
 2. Practice /s/ initial position words 5 times daily.
 3. Practice /s/ final position broken syllables 10 times daily.
 4. Practice /s/ final position syllables 10 times daily.

Level 4

- Objective:
1. To produce /s/ initial position syllables and words 10/10 times unmodeled.
 2. To produce /s/ final position broken syllables 10/10 times unmodeled.
 3. To produce /s/ final position syllables 10/10 times unmodeled.
 4. To produce /s/ final position in words 20/20 times modeled/unmodeled.
 5. To produce /s/ medial position in broken syllables 15/15 times modeled/unmodeled.
 6. To produce /s/ medial position in syllables 15/15 times modeled/unmodeled.

- Procedure:
1. Clinician will ask client to produce /s/ initial position syllables and words.
 2. Clinician will ask client to produce /s/ final position broken syllables and syllables.
 3. Clinician will model /s/ words (final position).
 4. Clinician will model /s/ broken syllables (medial position).
 5. Clinician will model /s/ syllables (medial position).

- Homework:
1. Practice /s/ final position syllables 5 times daily.
 2. Practice /s/ final position words 10 times daily.
 3. Practice /s/ medial position broken syllables 10 times daily.
 4. Practice /s/ medial position syllables 10 times daily.

Level 5

- Objective:
1. To produce /s/ final position syllables and

words 10/10 times unmodeled.

2. To produce /s/ medial position broken syllables and syllables 10/10 times unmodeled.
3. To produce /s/ medial position words 20/20 times modeled/unmodeled.
4. To produce /s/ initial, medial, final words 20/20 times modeled.

- Procedure:
1. Clinician will ask client to produce /s/ final position syllables and words.
 2. Clinician will ask client to produce /s/ medial position broken syllables and syllables.
 3. Clinician will model /s/ words (medial position).
 4. Clinician will model /s/ words (initial, medial and final position).

- Homework:
1. Practice /s/ medial position syllables 5 times.
 2. Practice /s/ medial words 10 times daily.
 3. Practice /s/ initial, medial and final words 10 times.

Level 6

- Objective:
1. To produce /s/ medial position syllables 10/10 times unmodeled.
 2. To produce /s/ medial position words 10/10 times unmodeled.
 3. To produce /s/ initial, medial and final position words 10/10 times unmodeled.
 4. To produce /s/ in sentences in all positions modeled.

- Procedure:
1. Clinician will ask client to produce /s/ medial position syllables.
 2. Clinician will ask client to produce /s/ words medial position.
 3. Clinician will ask client to produce /s/ initial, medial and final position words.
 4. Clinician will model /s/ sentences (initial, medial and final).

- Homework:
1. Practice /s/ initial, medial and final position words 10 times daily.
 2. Practice /s/ sentences 20 times.
 3. Practice reading a paragraph once daily, making sure all /s/ sounds are correctly produced.

Level 7

- Objective:
1. To produce /s/ initial, medial and final position words 10/10 times unmodeled.

2. To produce /s/ sentences 10/10 times unmodeled.
3. To read a paragraph (selected by clinician) using correct /s/ sounds.
4. To produce /z/ in isolation 20/20 times modeled/unmodeled.

Procedure:

1. Clinician will ask client to produce /s/ initial, medial and final words.
2. Clinician will ask client to produce /s/ sentences.
3. Clinician will listen to client read and track errors.
4. Clinician will explain the production of /z/ and will model /z/ sound.

Homework:

1. Practice /s/ sentences 10 times daily.
2. Practice reading 2 paragraphs daily, using correct /s/ sounds.
3. Practice /z/ in isolation 20 times daily.

The same progression for learning /z/ in broken syllables, syllables, words and sentences in all positions was followed as for the learning of the /s/ phoneme. Levels 8 through 12 were devoted to the production of /z/ phoneme. Level 13 was used for combining /s/ and /z/ sounds in sentences and in reading of paragraphs selected by the clinician. The final session was used for post-testing with McDonald's Deep Test of Articulation and in producing sentences selected by the research committee.

Management Program B

Level 1

Objective:

1. To correct tongue placement for swallowing by placing tip of tongue against the incisive papilla (hereafter called "the spot").
2. To do the above with a 3/16 H elastic on tip of tongue 5/5 times.
3. To initiate involuntary swallow by correctly placing tongue in "the spot", slurping (to collect saliva) and swallowing—lips apart 5/5 times.

- Procedure:
1. Clinician will explain importance of correcting deviate swallow and demonstrate correct placement for tip of tongue.
 2. Clinician will instruct client to repeat above with a 3/16 H elastic. Clinician will explain use of rubber band is to make client more aware of where the tongue tip is during swallowing and later, in a rest position.
 3. Clinician will instruct client to place tip of tongue in "the spot", to close back teeth together, slurp, and swallow. Exercise is to be done with lips apart.
 4. Clinician will give homework assignment (see Appendix L for sample assignment worksheet).

- Homework:
1. Practice six slurp and swallow (lips apart) 2 times first day.
 2. Practice 12 slurp and swallows 3 times daily with at least two hours in between sessions, thereafter.

Level 2

- Objective:
1. To demonstrate correct tongue placement for swallowing.
 2. To demonstrate involuntary correct swallow by using "slurp and swallow" 5/5 times.
 3. To initiate swallow voluntarily without "slurp" to collect saliva (refer to this as a 1, 2, 3 swallow) 3/3 times.
 4. To correct tongue placement "at rest" by lifting tongue to "the spot", closing lips, and holding tongue in that position using an elastic on tip of tongue (refer to this as Mother's Delight).

- Procedure:
1. Clinician will check tongue position for swallowing.
 2. Clinician will observe "slurp and swallow" and check tongue and jaw position.
 3. Clinician will explain voluntary swallow and ask client to put tongue up in "the spot" on count of 1, bite back teeth together on count of 2, collect saliva and swallow on the count of 3.
 4. Clinician will explain steps for tongue "at rest" exercise. Clinician will stress that the tongue is in a rest position approximately 80% of a 24 hour day. This exercise is done with the tongue up in "the spot", the lips together, and back teeth slightly apart (refer to teeth apart as a freeway space to

keep muscles from being in a constantly contracted position). Clinician explains client can do anything he wishes during this exercise except talk; hence, Mother's Delight.

- Homework:
1. Practice 12 swallows (1,2,3 swallow) three times daily.
 2. Practice tongue "at rest" 5 minutes daily (Mother's Delight).

Level 3

- Objective:
1. To demonstrate 1,2,3 voluntary swallow 5/5 times at beginning of session and 5/5 times at the end of the session.
 2. To demonstrate correct "at rest" tongue placement.
 3. To produce tongue-tip words (/t/, /d/, /n/, and /l/ words) (see Appendix J #7 for list of words).
 4. To strengthen anterior and middle tongue muscles by sucking tongue dorsum up to roof of mouth and holding for a count of 5 (refer to this as a "cluck and hold" exercise) 10/10 times.

- Procedure:
1. Clinician will observe and check tongue position, back teeth together and lips apart during this exercise.
 2. Clinician will check "at rest" position, noting especially whether lips are together and back teeth slightly parted.
 3. Clinician will model the tongue-tip words and will instruct client to place tongue tip firmly against alveolar ridge when producing the [t,d,n, and l]. This is done as a muscle exercise, not as articulation therapy.
 4. Clinician will demonstrate "cluck and hold" exercise and explain reason for doing the exercise.

- Homework:
1. Practice 12 swallows (1,2,3 swallow) three times daily.
 2. Practice tongue "at rest" 10 minutes daily.
 3. Practice tongue-tip words 5 times daily.
 4. Practice "cluck and hold" exercise 10 times/3 times daily.

Level 4

- Objective:
1. To demonstrate 1,2,3 swallow 5/5 times at beginning and end of session.
 2. To produce tongue-tip words 100% correctly.
 3. To demonstrate "cluck and hold" to count of 5, 10/10 times.

4. To swallow using two rubber bands, one placed on tip of tongue and one placed in the middle of tongue (exercise is to strengthen middle of tongue).
5. To produce middle of tongue words [tʃ, dʒ] (see Appendix L #9 for list of words).

- Procedure:
1. Clinician will observe and check tongue position, back teeth together and lips apart during this exercise.
 2. Clinician will listen to words and check tongue position during production of [t, d, n, and l].
 3. Clinician will observe "cluck and hold" exercise and will note whether middle of tongue is being lifted up during the exercise.
 4. Clinician will demonstrate 2 rubber band exercise and explain reason for doing this exercise.
 5. Clinician will model middle of tongue words and instruct client to "push" with the middle of tongue on the /tʃ/ and /dʒ/ sounds.

- Homework:
1. Practice 12 swallows (two elastic swallow) three times daily.
 2. Practice tongue "at rest" 15 minutes daily.
 3. Practice "cluck and hold" thirty times daily.
 4. Practice middle of tongue words 5 times daily.

Level 5

- Objective:
1. To demonstrate 2 elastic swallow 5/5 times at beginning and end of session.
 2. To demonstrate "cluck and hold" 15/15 times.
 3. To produce the middle of tongue words 100% correctly.
 4. To demonstrate correct swallow with food.
 5. To strengthen the masseter muscles by chewing on 1/2 inch pieces of surgical rubber tubing.

- Procedure:
1. Clinician will observe 2 elastic swallow, noting whether second elastic remains in the middle of tongue after swallow is completed.
 2. Clinician will observe the "cluck and hold" exercise (watch especially for middle of tongue being raised to roof of mouth).
 3. Clinician will listen to middle of tongue words, noting whether client pushes with middle of tongue on /tʃ/ and /dʒ/ sounds as instructed.
 4. Clinician will instruct client to take bite of food, chew it up, and collect it on dorsum of tongue about where the second elastic

was placed, put elastic on tip of tongue, raise tip of tongue to "the spot" and swallow. Tongue should be cleared of food if exercise is done correctly.

- Homework:
1. Practice 12 swallows (two elastic swallow) three times daily.
 2. Practice tongue "at rest" 20 minutes daily.
 3. Practice "cluck and hold" 30 times daily.
 4. Practice swallowing with food by eating a cracker; take small bites, collect food on back of tongue, use elastic on tip of tongue. This exercise is to be done twice daily.

Level 6

- Objective:
1. To demonstrate 2 elastic swallow 5/5 times at beginning and end of session.
 2. To demonstrate "cluck and hold" 20/20 times.
 3. To swallow food, using elastic on tip of tongue.
 4. To strengthen lip muscles by doing lip massages and button pulls.

- Procedure:
1. Clinician will observe 2 elastic swallow, watching for tongue position and jaw position during swallowing.
 2. Clinician will observe the "cluck and hold" exercise.
 3. Clinician will observe swallow with food, checking especially for tip of tongue placement and clearing of mouth after swallowing.
 4. Clinician will explain and demonstrate lip exercises. The lip massages are done by bringing lower lip up over top lip and pulling lower lip down slowly. Clinician will instruct client to insert one inch button between his lips and pull it out slowly.

- Homework:
1. Practice 12 swallows (two elastic swallow) three times daily.
 2. Practice tongue "at rest" 25 minutes daily.
 3. Practice "cluck and hold" 30 times daily.
 4. Practice swallowing with food by eating 1/2 meal using correct swallow (use elastic on tip of tongue for each swallow).
 5. Practice lip exercises; lip massages are to be done 50 times, three times daily and button pulls are to be done 10 times, three times daily.

Level 7

- Objective:
1. To demonstrate 2 elastic swallow 5/5 times

- at beginning and end of session.
- 2. To demonstrate "cluck and hold" 20/20 times.
- 3. To swallow food, using elastic on tip of tongue, 5/5 times.
- 4. To demonstrate lip exercises (lip massages and button pulls).
- 5. To swallow with 3 elastics on tongue; one on tip, one in the middle and one on the back of the tongue.
- 6. To produce the back tongue words (/k/ and /g/ words) (see Appendix L #12 for list of words).

- Procedure:
- 1. Clinician will observe 2 elastic swallow and check tongue position.
 - 2. Clinician will observe "cluck and hold" and check use of correct muscles.
 - 3. Clinician will observe proper swallow during eating of cracker.
 - 4. Clinician will measure lip strength with force scale.
 - 5. Clinician will instruct client in swallowing with 3 elastics and explain the third elastic is to remind client to lift the back of the tongue up during swallowing.
 - 6. Clinician will model the back tongue words.

- Homework:
- 1. Practice 12 swallows (three elastic swallow) three times daily.
 - 2. Practice tongue "at rest" 30 minutes daily.
 - 3. Practice "cluck and hold" 30 times daily.
 - 4. Practice swallowing food by eating one whole meal using correct swallow (use elastic as before).
 - 5. Practice lip exercises; lip massages 60 times, three times daily and button pulls 12 times, three times daily.
 - 6. Practice back tongue words 5 times daily.
 - 7. Practice chewing on rubber tubing for 30 minutes daily.

Level 8

- Objective:
- 1. To demonstrate 3 elastic swallow 5/5 times at beginning and end of session.
 - 2. To demonstrate "cluck and hold" 15/15 times.
 - 3. To swallow food, using elastic on tip of tongue 5/5 times.
 - 4. To demonstrate lip strength by doing lip massages and button pulls.
 - 5. To produce back tongue words 100% correctly.
 - 6. To track tongue position away from clinic by keeping a time chart (#1) as set up by clinician.

- Procedure:
1. Clinician will observe 3 elastic swallow and check that all three elastics are in proper position after swallow is completed.
 2. Clinician will observe "cluck and hold" and check use of correct muscles.
 3. Clinician will observe proper swallow during eating of cracker.
 4. Clinician will measure lip strength with force scale.
 5. Clinician will listen to back tongue words.
 6. Clinician will explain use of time charts as means of making client more aware of tongue position away from the clinic. Clinician will set up four times for client to check tongue position and show client how to chart or track. Client will be instructed to bring time chart with him next time he comes to clinic.

- Homework:
1. Practice 12 swallows (three elastic swallow) three times daily.
 2. Practice tongue "at rest" 35 minutes daily.
 3. Practice "cluck and hold" 30 times daily.
 4. Practice swallowing food by eating two meals (use elastic for one meal).
 5. Practice lip exercises; lip massages 70 times, three times daily and button pulls 14 times, three times daily.
 6. Practice chewing on rubber tubing for 30 minutes daily.
 7. Track tongue position 4 times daily on chart set up by clinician.

Level 9

- Objective:
1. To demonstrate 3 elastic swallow 5/5 times at beginning and end of session.
 2. To swallow food, using elastic on tip of tongue 5/5 times.
 3. To demonstrate lip strength by doing button pulls.
 4. To demonstrate tongue position by showing clinician chart made during previous days since last visit to clinic.
 5. To demonstrate swallow with liquids.

- Procedure:
1. Clinician will observe 3 elastic swallow.
 2. Clinician will observe swallow during eating.
 3. Clinician will measure lip strength with force scale.
 4. Clinician will check tongue position chart and give new times for time chart #2.
 5. Clinician will demonstrate correct swallow with

liquids. Clinician will instruct client to drink all liquids with back teeth together. This keeps tongue from coming forward between the teeth and/or against the glass as client drinks.

- Homework:
1. Practice 10 swallows (three elastic swallow) three times daily.
 2. Practice tongue "at rest" 40 minutes daily.
 3. Alternate the "cluck and hold" exercise and the chewing on rubber tubing; chew one day and "cluck" the next.
 4. Practice swallowing food by eating all meals correctly (use elastic for one meal).
 5. Practice lip exercises; lip massages 80 times three times daily and button pulls 16 times, three times daily.
 6. Track tongue position 4 times daily on chart set up by clinician.
 7. Practice drinking all liquids with new swallow in which back teeth are together.

Level 10

- Objective:
1. To demonstrate 3 elastic swallow 5/5 times.
 2. To swallow food, using elastic on tip of tongue 5/5 times.
 3. To demonstrate lip strength by doing button pulls.
 4. To demonstrate tongue position by showing clinician time chart #2.
 5. To swallow liquids using new swallow with back teeth together.
 6. To make reminder sign for dinner table (purpose of sign is to remind client to use correct swallow at all meals).

- Procedure:
1. Clinician will observe 3 elastic swallow.
 2. Clinician will observe swallow during eating.
 3. Clinician will measure lip strength with force scale.
 4. Clinician will check tongue position chart and give new times for time chart #3.
 5. Clinician will observe swallow with liquids, noting whether back teeth are held together as client drinks.
 6. Clinician will explain the reason for making reminder sign for dinner table and suggest reminder signs be made for other places, such as notebook, if needed.

- Homework:
1. Practice tongue "at rest" 45 minutes daily.
 2. Practice swallowing food by eating all meals

correctly.

3. Alternate the "cluck and hold" exercise and the chewing on rubber tubing, chew one day and "cluck" the next.
4. Practice lip exercises; lip massages 80 times twice daily and button pulls 18 times, twice daily.
5. Track tongue position 4 times daily on chart set up by clinician.
6. Practice drinking all liquids with back teeth together.
7. Make reminder sign for dinner table and any other place where one is needed as a reminder. Bring one reminder sign to clinic next visit.

Level 11

- Objective:
1. To demonstrate correct swallow 3/3 times.
 2. To swallow food 5/5 times.
 3. To demonstrate lip strength by doing button pulls.
 4. To demonstrate tongue position by showing clinician time chart #3.
 5. To swallow liquids using new swallow with back teeth together.
 6. To show clinician reminder sign made for use at home/school.

- Procedure:
1. Clinician will observe correct swallow.
 2. Clinician will observe swallow during eating.
 3. Clinician will measure lip strength with force scale.
 4. Clinician will check tongue position chart.
 5. Clinician will observe swallow with liquid.
 6. Clinician will instruct client in a night time program. Client is to swallow six times correctly after he is in bed and ready to go to sleep. He is to say to himself "I will sleep with my tongue up," and he is to note tongue position the first thing in the morning when he awakes.

- Homework:
1. Practice tongue "at rest" 50 minutes daily.
 2. Practice correct swallowing during all eating and drinking.
 3. Use correct swallow at night time by following night program outlined by clinician; remember to chart tongue position in the morning.
 4. Practice lip exercises; lip massages 80 times once daily and button pulls 18 times once daily.

After completion of level 11, the client will use the

following two sessions (levels 12 and 13) to strengthen areas of weakness and to stabilize new muscle patterns for the tongue "at rest" position as well as muscle patterns for swallowing. The final session will be used for post-testing with McDonald's Deep Test of Articulation and in producing sentences selected by the research committee.

Management Program C

This program will be divided at each level of treatment between articulation therapy and myofunctional therapy. There will be thirteen levels of management and a final session to be used for post-testing with McDonald's Deep Test of Articulation and in producing sentences selected by the research committee.

An example of Program C is as follows:

Level 1

- Objective:
1. To correct tongue placement for swallowing by placing tip of tongue against the incisive papilla. Repeat this using a 3/16 H elastic on tip of tongue, 5/5 times.
 2. To initiate an involuntary swallow by correctly placing tongue in "the spot," slurping (to collect saliva), and swallowing--lips apart, 5/5 times.
 3. To place tip of tongue on "the spot" and lightly blow air (airstream directed forward between upper centrals and direction of air flow checked by using a straw) to produce the /s/ sound, 20/20 times modeled/unmodeled.
 4. To produce /s/ plus vowel in syllables, 20/20 times modeled/unmodeled.

- Procedure:
1. Clinician will explain importance of correcting deviate swallow and demonstrate correct

- placement for tip of tongue. Clinician will then instruct client to place tongue tip against the incisive papilla. Clinician will ask client to repeat above procedure using a 3/16 H elastic on tongue tip and will explain the rubber band is to make client more aware of where the tongue tip is during swallowing.
2. Clinician will instruct client to place tip of tongue in "the spot," to close back teeth together, slurp and swallow.
 3. Clinician will instruct client to place tongue tip on "the spot," approximate the jaw, and lightly blow air.
 4. Clinician will instruct client to sustain /s/ and add vowel.

- Homework:
1. Practice six slurp and swallows (lips apart) 4 times daily with at least 1/2 hour between sessions.
 2. Practice the /s/ sound 20 times daily.
 3. Practice /s/ syllables 10 times daily.

Analysis of Data

Each client was given the McDonald Deep Test of Articulation for the /s/ and /z/ phonemes at the beginning and at the end of the six week program. Each client's scores were compared on an individual basis to see if therapy improved the articulation skills from pre-test to post-test. A comparison of the three client's scores was made on a combined raw score and a percentage basis to see which type of therapy showed the greater improvement.

CHAPTER IV

RESULTS AND DISCUSSION

Results

The purpose of this research and demonstration project was to determine which of three methods for treating an anterior lisp (articulation only, myofunctional only, and combined articulation and myofunctional) would effect the greater change in articulatory patterns for the /s/ and /z/ phonemes.

At the beginning of the program each client was given the McDonald Deep Test of Articulation for the /s/ and /z/ phonemes. Clients were re-tested using the same instrument at the end of six weeks of intervention. Table I shows the raw scores and percentages of correct productions for /s/ and /z/ by each client together with both the total raw scores and percentage of gains from the pre and post-tests. Figure 2 shows percentage of gain in relationship to the management program for each client. Here it is to be noted Client A, whose management was a traditional articulation program, made the greatest gain in the six weeks of intervention. Client B, treated with a combined program of myofunctional and articulation therapy was second in percentage of gain as measured at the word level, followed by

TABLE I

McDonald Deep Test of Articulation

Raw Scores and Percentage Scores at Word Level

Clients	Pre-Test			Post-Test			Gains	
	/s/	/z/	Total	/s/	/z/	Total	Raw Score	%
A	7(15%)	7(15%)	14(15%)	45(98%)	44(96%)	89(97%)	75	(82%)
B	10(22%)	12(26%)	22(24%)	42(91%)	44(96%)	86(93%)	64	(69%)
C	11(24%)	9(20%)	20(22%)	38(83%)	36(78%)	74(80%)	54	(58%)

Total /s/ Productions 46

Total /z/ Productions 46

Combined Total 92

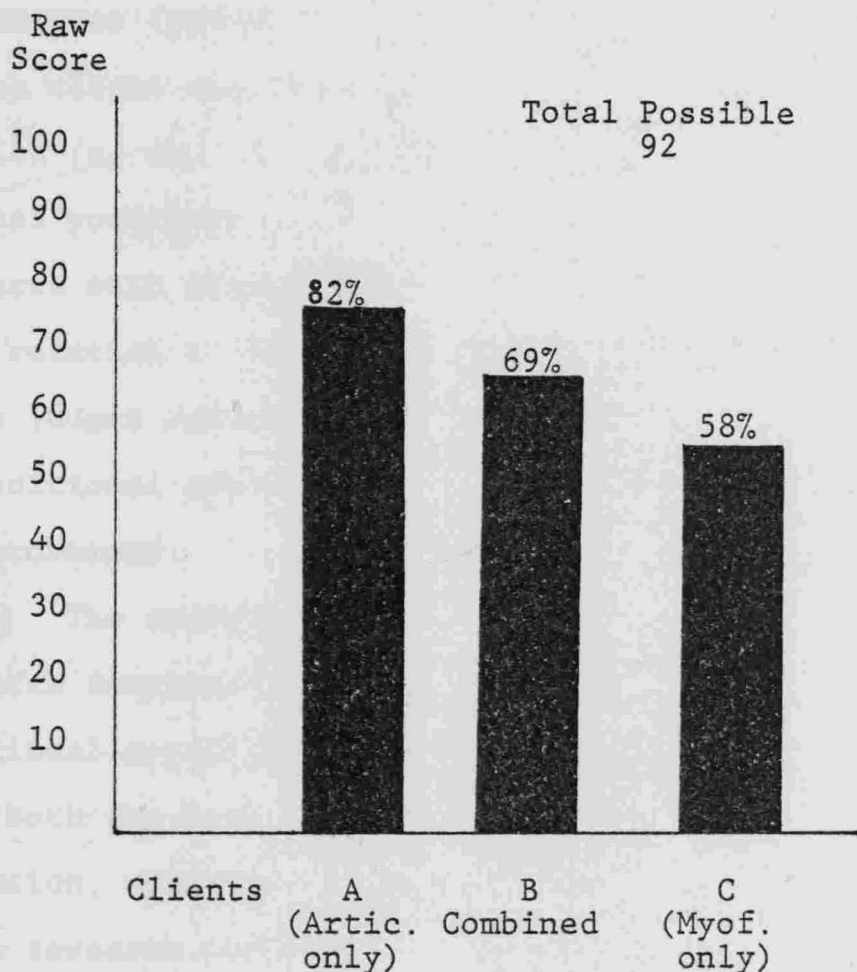


Figure 2. Raw score and percentage of gain in relation to the management program at the word level.

Client C, who received myofunctional therapy only.

As part of the post-test procedures, each client was given a list of four sentences (see Appendix M for sentences) and judged independently by two members of the research committee (referred to as RC-1 and RC-2 on Tables II and III). Each client was allowed two productions of each sentence in which /s/ and /z/ appeared twice in the initial, medial, and final positions of words. Figure 3 shows the total raw scores with percentages of correct productions for each client in relation to the three programs of therapy. Findings by the two judges agreed with the investigator that Client A, on a traditional articulation program, made the greatest overall improvement.

The answer, then, to question number one of this research demonstration project has been answered. The traditional articulation approach shows the greatest improvement at both the word and sentence level for a short term intervention, according to the findings of this investigator and the research committee. Comparison of the remaining two programs must be made independently at the word and sentence level. Client B (combined therapies) was second in gains, followed by Client C (myofunctional only) at the word level. Client C (myofunctional only), however, was rated above Client B (combined) for total correct productions of /s/ and /z/ in connected speech. Possible explanations for these discrepancies will be discussed later under the discussion section of this chapter.

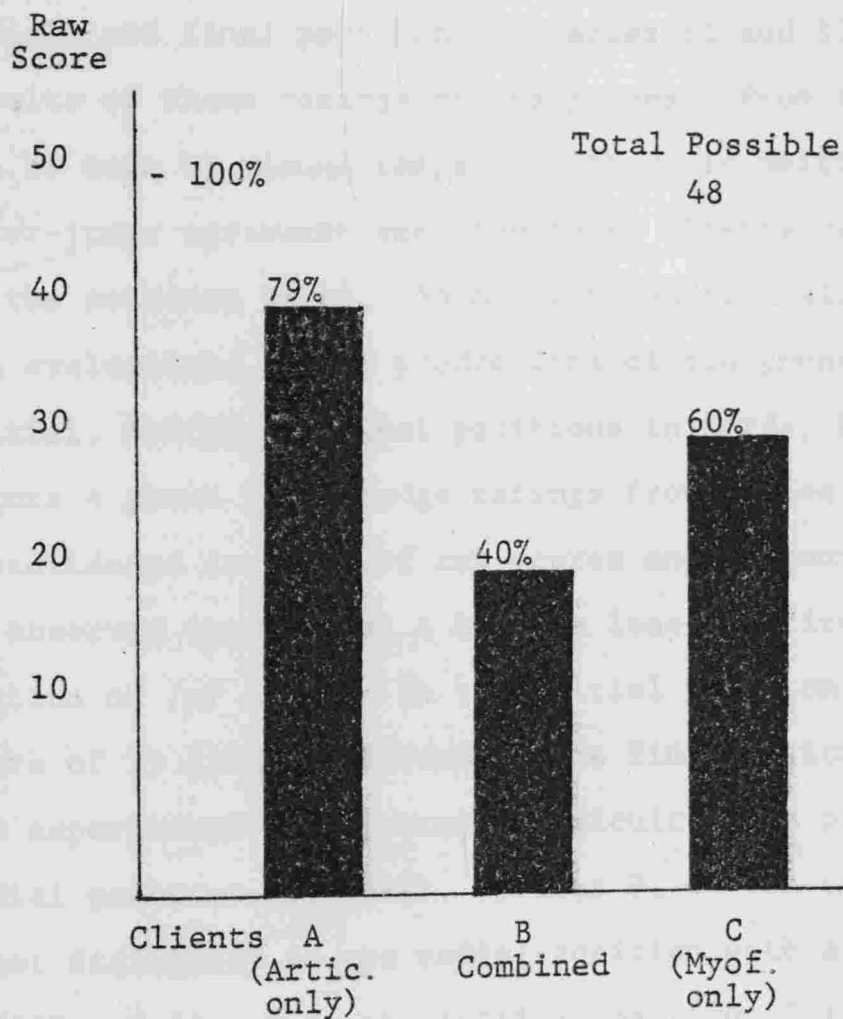


Figure 3. Raw score and percentage of gain in relation to the management program at the sentence level.

To further analyze evaluations of the three clients made by the two judges, data were tabulated in accordance with the position of /s/ and /z/ within a word (i.e., initial, medial, and final positions). Tables II and III present the results of these ratings by the judges. From these tables it can be seen by visual inspection there is neither intra- nor inter-judge agreement when the three clients were evaluated at the sentence level. In order to additionally analyze the evaluations of the productions of the phonemes in the initial, medial and final positions in words, however, Figure 4 shows intra-judge ratings from Tables II and III, consolidated in terms of raw scores and percentages. It can be observed that Client A had the least difficulty with production of /s/ and /z/ in the initial position with a raw score of 15 (94%), followed by the final position, 13 (81%) and experienced the greatest difficulty with phonemes in the medial position, 10 (63%). Client B, on the other hand, had least difficulty in the medial position with a raw score of 8 (50%), followed by the initial position, 7 (44%), with the most difficulty in the final position, 4 (25%). Client C, as Client A, experienced least difficulty with /s/ and /z/ in the initial position, 11 (69%), and showed similar difficulty with the phonemes in the medial and final positions, 9 (56%).

In order to determine which sound was produced accurately with greater frequency during post-testing, the data were tabulated at both the word and sentence levels, and it was noted /s/ was produced with only slightly greater

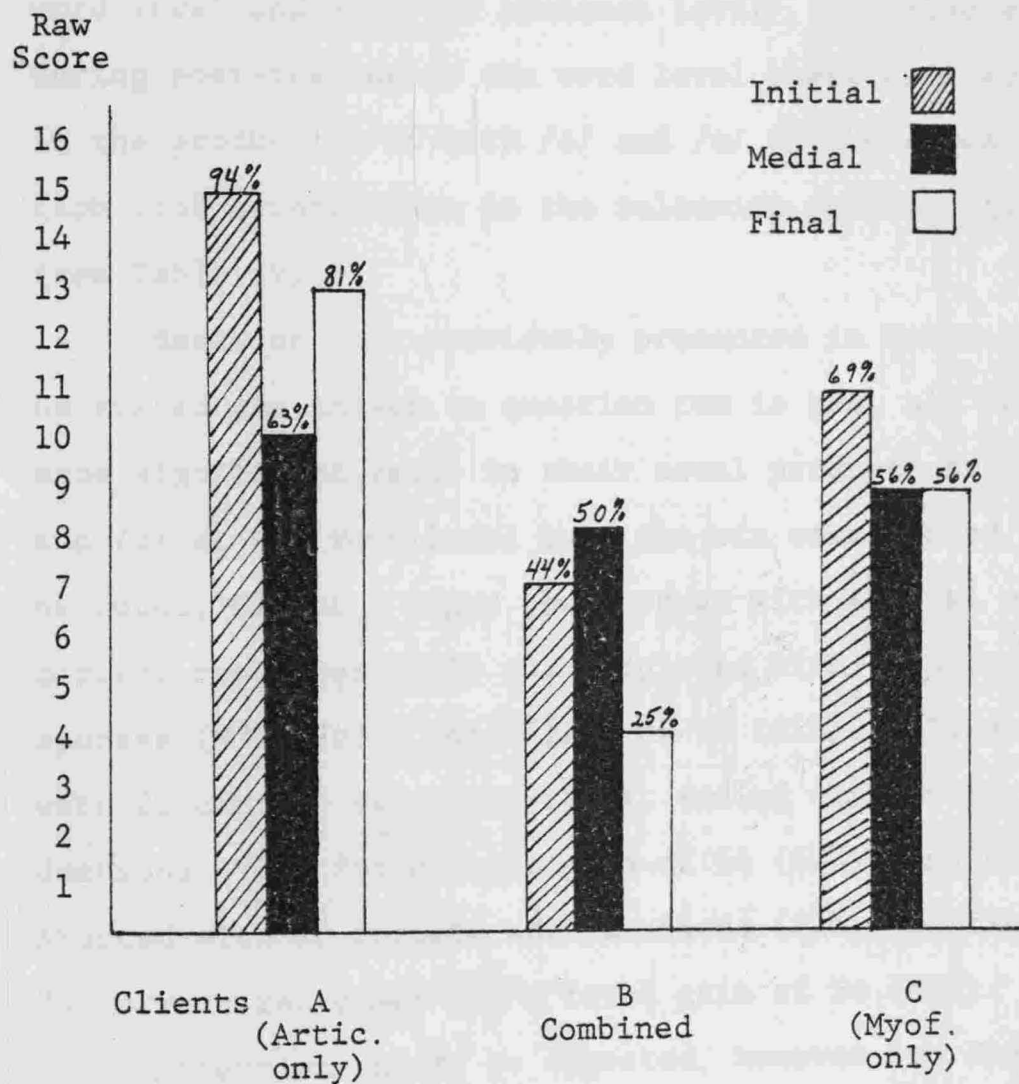


Figure 4. Raw scores and percentages of correct productions for /s/ and /z/ in relation to position in words.

frequency than /z/ (the difference being 3 points at the word level and 6 at the sentence level). It also was noted during post-testing at the word level there were more errors in the production of both /s/ and /z/ in the arresting position (130 errors) than in the releasing position (117 errors) (see Table IV).

Based on data previously presented in Table I, it can be stated the answer to question two is yes, all three clients made significant gains in their total productions for /s/ and /z/ at the word level over the six week period. It is to be noted, Client A began the program with a total of 14 correct responses (15%) and completed with 89 correct responses (97%) for a total gain of 75 (82%). Client B began with 22 correct responses (24%), ending with 86 correct productions (93%) for a total gain of 64 (69%), and Client C started with 20 correct articulations (22%) and finished with 74 correct responses for a total gain of 54 (58%).

Attention should be directed, however, to the fact that Client C received only myofunctional therapy during the six weeks of intervention and still showed an improvement in articulation. This apparent variation will be discussed later.

Myofunctional therapy was used for two of the three clients; one client (Client B) received both myofunctional therapy and articulation therapy, and one (Client C) received only myofunctional therapy. Tables V and VI show the myo-

TABLE IV

McDonald Deep Test of Articulation Errors in Terms of Releasing and Arresting

Clients	Pre-test				Post-test				Totals	
	/s/		/z/		/s/		/z/		/s/ &	/z/
	R	A	R	A	R	A	R	A	R	A
A	20	20	18	21	0	1	0	2	38	44
B	20	14	12	22	2	2	2	0	36	38
C	19	16	17	19	4	4	3	9	43	48
Totals	59	50	47	62	6	7	5	11	117	130
Total errors in production	109		109		13		16			

R=releasing or initiating
A=arresting or terminating

TABLE V
Myofunctional Profile Before Intervention

Clients	Swallow Pattern	Lip Strength	Masseter	Mentalis	Mouth Breathing
A	Anterior Tongue Thrust	1½ lbs.	Fair	Normal	Yes
B	Anterior Tongue Thrust	2½ lbs.	Fair	Over-Developed	Yes Lips Chapped
C	Anterior Tongue Thrust	1 lb.	Fair	Over-Developed	Yes

TABLE VI
Myofunctional Profile After Intervention

Clients	Swallow Pattern	Lip Strength	Masseter	Mentalis	Mouth Breathing
A	Anterior Tongue Thrust	1½ lbs.	Fair	Normal	Yes
B	Correct Swallow Pattern in clinic	4½ lbs.	Fair	Relaxed during Swallowing	Improved Not as chapped
C	Correct Swallow Pattern in clinic	3 lbs.	Fair	Relaxed during Swallowing	Improved in clinic

functional profile for each client before and after intervention. Here it is to be observed the two clients receiving myofunctional therapy both improved their swallowing patterns; each went from an anterior tongue thrust to a more normal swallow pattern (see Appendices N, O, and P for the Payne Technique charts for each client showing before and after swallowing patterns). There was a two pound improvement for both clients in lip strength, as shown by measuring with the lip force scale. This places lip strength within the normal limits of 3 to 5 pounds (Garliner, 1974). Both clients improved habitual mouth breathing while in the clinic setting. The two clients demonstrated a more relaxed mentalis muscle during swallowing after intervention. Masseter strength remained unchanged and was subjectively rated as fair before and after treatment.

It should be noted, although Client A showed the greatest gains in articulation, there was no improvement in her myofunctional profile. Client C, who received only myofunctional therapy, on the other hand, did show some articulation improvement.

Discussion

It has been reported in the literature by such investigators as Jann (1972), Barrett and Hanson (1974), Goda (1968), and Garliner (1974) that myofunctional therapy is a necessary adjunct to articulation management for correction of an anterior lisp in clients who are tongue thrusters. It was

hypothesized by this investigator, based on some experience with the problem and in light of the foregoing investigations, a combined therapy might be the intervention program most appropriate for these cases. Accordingly, three methods for treating an anterior lisp (articulation only, myofunctional only, and a combination of articulation and myofunctional therapy) were initiated to see which would effect the greater change in articulatory patterns for the /s/ and /z/ phonemes.

Three clients who displayed an anterior tongue thrust, an anterior lisp, and who had no previous intervention were selected for a six weeks program. The results of this project, as shown in Table I and Figures 2 and 3, show conclusively the client in the traditional articulation program showed the greatest gains at both the word and sentence level, after six weeks of intervention.

The investigator found Client B, who was on a combined program, to be second in terms of improvement at the word level. The research committee, however, rated Client B as the poorest in producing sentences. This apparent discrepancy in the findings might have been due to the client's tendency toward a postural problem in which she placed the tongue tip against the mandibular teeth or alveolar ridge. In so doing, the air stream was misdirected over an elevated lower lip, causing a distortion of the /s/ and /z/ in rapid connected speech (see photograph of occlusion, Appendix I).

These clinical research findings would tend not to support combining articulation and myofunctional procedures into a single therapeutic process; favoring, instead, a separate treatment program for each of the two methodologies. One must keep in mind, however, that one must guard against making a broad generalization from a limited sample.

However, these data do tend to support suggestions to be found in the literature. One might, as suggested, initiate a myofunctional therapy followed by an articulation treatment procedure, or proceed in the reverse order. Profitt and Mason (1975) state if lisping and tongue thrust or malocclusion or both co-exist before puberty, one should initiate speech intervention in spite of concurrent problems. Fletcher et al. (1961), on the other hand, have suggested the most advantageous approach to speech remediation in these cases would be to first modify the swallowing pattern, followed by management of the residual articulation problem. Based on the findings of the current clinical research and demonstration project, the investigator tends to agree with Fletcher et al. The investigator's reasoning is based on the fact that Client C, who had only myofunctional therapy, demonstrated some speech improvement without having had any direct speech intervention. It would appear learning tongue-tip elevation might set up a more desirable environment in which to learn correct production of sibilant sounds. One cannot predict long term carry-over based on the

results of the present project; however, it might be theorized although Client A (articulation only) demonstrated the greatest short term gains, she showed no improvement in the myofunctional profile. Therefore, mouth breathing and tongue thrusting were unchanged and might tend to cause a breakdown in the /s/ and /z/ production which require an elevated tongue tip and approximated jaw. According to Goda (1968), tongue-tip elevation for production of certain speech sounds can only be ensured if there is tongue-tip elevation during swallowing as well.

This investigator is of the opinion length of intervention may be an important factor. Whereas Client A did nothing but articulation practice for six weeks and Client C nothing but myofunctional activities, Client B's time was split between the two tasks. Thus, it might be hypothesized that with a longer period of intervention and use of branching techniques to correct the lowered tongue tip in connected speech, Client B might have made greater gains. As mentioned above, she would have the better chance of the three for maintenance, having learned correct swallowing habits. This includes both tongue-tip elevation and jaw approximation, which are necessary, according to Darley (1964), to alleviate a lisp and correct articulatory patterns.

Client C (myofunctional only), although showing the slightest gain in correct production at the word level, was rated as being better in connected speech than Client B (combined procedures). The two independent judges partici-

pating in the project noted she was using various occlusal and tongue adjustments in a searching manner, and, on occasion, she appeared to generalize tongue-tip elevation to the production of /s/ and /z/ phonemes. Garliner (1974) states ". . . re-positioning of the tongue, and the re-education of the orofacial muscles, will have a significant effect on the articulatory process. The patient exhibits more facility and mobility of the tongue muscles." It must be noted at this point, however, that Client C's newly acquired muscle patterns may regress due to occlusal relationships. She demonstrates a Class I molar relationship with a protrusion of 8mm and an anterior open bite (see photograph of occlusion Appendix J). As noted by Barrett and Hanson (1974), swallowing patterns may not stabilize where there is need for orthodontic intervention in order to bring anterior teeth into a more normal relationship and alleviate the open pathway through which the tongue can easily travel. This does not mean, however, myofunctional treatment and/or speech therapy are contraindicated during or following orthodontic treatment.

It has been previously noted the ratings of productions of /s/ and /z/ by the three clients at the sentence level showed marked intra-judge variability (Tables II and III). It is felt this variability, in part, was due to the inconsistencies of the clients in their productions of these two phonemes. Such inconsistency suggests, after six weeks of intervention, the /s/ and /z/ would appear to be stabili-

zing in single words (as shown in Table I), which is not the case at the sentence level.

From the data shown in Figure 4, it can be noted at the word level Clients A and C would profit by beginning therapy with the phoneme in the initial position. Client A showed the next greatest facility with the final position, while Client C showed equal ease in both medial and final productions. Client B, on the other hand, showed almost equal ease with initial and medial (medial led by one production) and most difficulty with the final position. These data tend to agree with beginning treatment at the initial position but show variability thereafter, which tends to support the early work by Ainsworth (1948), whose preference was to begin teaching a sound in the initial position. He stated, however, the alert clinician should adopt teaching strategies to the individual and there should be no hesitation in switching emphasis if one plan fails to work. Hence, it would appear that progression beyond the initial position would be dependent on the individual client. This is not compatible with the progression suggested by Van Riper (1972), where he advocates beginning sound production at the initial, followed by final and lastly, by the medial position, nor does it tend to support the view of Scott and Milisen (1954), who suggest moving from initial to medial to final position. Based upon results of at least two clients (Clients A and C), these findings would not be incompatible to the concept

advanced by McDonald (1964), who believes there is no medial consonant, only those which initiate or arrest a syllable, analagous to initial and final. He suggests, "The concept of initial, medial, and final consonants has little or no validity." This concept, according to McDonald, seems to be based on written speech, whereas analyses of spoken speech indicate consonants may more meaningfully be described as simple (single consonant which serves to release or arrest a syllable), or compound (group of two or more consonants which are different sounds, one of which arrests the first syllable and the other releases the following; i.e., "st" in history).

As stated earlier, the production of /s/ and /z/ were analyzed to determine which sound was produced accurately with greater frequency. In terms of time spent in teaching these sounds, it should be noted seven out of twelve sessions (58% of the time) were spent in the production of /s/, while only four out of twelve sessions (33% of the time) were spent on the production of /z/, which suggests there may be transfer of learning from one to the other; i.e., in this project, transfer from the voiceless /s/ to the voiced cognate /z/.

CHAPTER V

SUMMARY AND CLINICAL IMPLICATIONS

Summary

The purpose of this research demonstration project was to see which of three methods for correction of an anterior lisp would effect the greater change in articulatory patterns. Therefore, three clients, ages nine through twelve years (each with a frontal lisp and an anterior tongue thrust), were selected and given six weeks of intensive management, including specific home assignments. Each client was placed in a different management program (Client A, articulation only; Client B, combined articulation and myofunctional therapy; and Client C a myofunctional only program). Clients were pre and post-tested for correct production of /s/ and /z/ phonemes utilizing the McDonald Deep Test of Articulation. Additionally, clients were given sentences with /s/ and /z/ in initial, medial, and final positions by two members of the research committee.

It was conclusively shown at both the word and sentence levels Client A, who received the articulation only therapy, made the highest gains. Hence, the answer to the first question is that articulation only produced the greater, immediate gains of the three methods used over the six week

period. At the word level, the second largest gain was made by the client using a combined therapy (Client B), and the smallest gains were demonstrated by the client on a myofunctional only program (Client C). It should be stated, however, there was some degree of improvement shown by each client in articulation skills, regardless of the type of management.

The second question investigated was whether a client's speech would significantly improve after only six weeks of management. The three clients started the program with at least a 75% error score in the articulation of the /s/ and /z/ phonemes at the word level. In reviewing improvement of the three clients after the six weeks period, it was found all improved considerably. The minimum amount of growth demonstrated was by Client C, who improved from a pre-test score of 20 (22%) correct on the McDonald Deep Test of Articulation to 74 (80%) correct on the post-test. Therefore, the answer to the second question is an unequivocal yes, six weeks of therapy definitely improved articulation skills at the word level. It should be noted, although some improvement was shown at the sentence level, clients were inconsistent in their productions, as might be expected after only six weeks of therapy.

Of interest in this project was the fact that Client C, who received no direct articulation intervention, improved in not only myofunctional skills, but in articulatory skills as well at both the word and sentence level, while

Client A (articulation only) maintained the same myofunctional profile; i.e., there was no change in oral facial muscle strength or in muscle patterns for swallowing. Thus, this investigator feels there was some carry-over in tongue elevation and jaw approximation from newly learned swallowing patterns into phonation.

The quest for information concerning the relationships between tongue thrust, malocclusion, and defective speech continues. Subtelny et al. (1964) report there is a variable relationship between these; however, those in their study with the most defective articulation of sibilant sounds fronted the tongue-tip excessively. A number of authorities agree that a forward placement of the tongue-tip during speech contributes significantly to the persistence of articulation variations (Perkins, 1971; Francis, 1958; Fletcher et al., 1961; Ward et al., 1961; Hanson and Barrett, 1974; and Garliner, 1974).

This research project has answered the questions it proposed to study. The investigator, however, strongly feels a myofunctional program together with an articulation management program should be the therapy plan of choice for an anterior lisp and concomitant tongue thrust. The reasoning is based on the observation that myofunctional treatment may set-up a desirable environment for changing articulatory patterns, as demonstrated by Client B. It is interesting to note, in passing, Client C made improvement without direct intervention due to the learning of tongue-tip elevation and

jaw approximation developed in the myofunctional program.

Implications for Future Study

The unanswered question beyond this study is to what degree will there be carry-over and maintenance of the newly learned muscle patterns for articulation, and, therein lies the true test of value for any intervention program. Thus, it is hoped by this investigator similar studies will be conducted in the future over an extended period of time, using a larger population. It might be suggested, in light of this project, such studies should employ a combined program using myofunctional therapy followed by articulation intervention, rather than run the two therapies concurrently, as was done in this research demonstration project.

Inter-judge reliability should be established through training of judges prior to initiation of the project. Additionally, exact criteria should be established and agreed upon by all those involved in the study as to what a correct phonation will be by degrees (i.e., a rating scale of 0, or normal, to 5, or severely distorted), including both the acoustic and physiological aspects.

According to Johnson et al. (1963), Jann (1964) and Subtelny et al. (1964), to mention only a few, the most common of all speech defects is the frontal lisp. Hopefully, this research demonstration project will provide a spark for a more thorough and longer project from which more conclu-

sive evidence relative to treatment methodology may be obtained.

In conclusion, this investigator believes the problems of the individual with both a myofunctional disorder and concurrent sibilant distortion must be the basis of future research. Descriptive and empirical data are needed if management programs are going to be successful. The occurrence of this acoustic and physiological disorder is of such magnitude it deserves the attention of clinicians and researchers alike.

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1. The first of the following is a list of the names of the persons who have been named in the following table.

2. The second of the following is a list of the names of the persons who have been named in the following table.

3. The third of the following is a list of the names of the persons who have been named in the following table.

4. The fourth of the following is a list of the names of the persons who have been named in the following table.

5. The fifth of the following is a list of the names of the persons who have been named in the following table.

APPENDICES

6. The sixth of the following is a list of the names of the persons who have been named in the following table.

7. The seventh of the following is a list of the names of the persons who have been named in the following table.

8. The eighth of the following is a list of the names of the persons who have been named in the following table.

9. The ninth of the following is a list of the names of the persons who have been named in the following table.

10. The tenth of the following is a list of the names of the persons who have been named in the following table.

11. The eleventh of the following is a list of the names of the persons who have been named in the following table.

12. The twelfth of the following is a list of the names of the persons who have been named in the following table.

13. The thirteenth of the following is a list of the names of the persons who have been named in the following table.

14. The fourteenth of the following is a list of the names of the persons who have been named in the following table.

15. The fifteenth of the following is a list of the names of the persons who have been named in the following table.

16. The sixteenth of the following is a list of the names of the persons who have been named in the following table.

17. The seventeenth of the following is a list of the names of the persons who have been named in the following table.

18. The eighteenth of the following is a list of the names of the persons who have been named in the following table.

19. The nineteenth of the following is a list of the names of the persons who have been named in the following table.

20. The twentieth of the following is a list of the names of the persons who have been named in the following table.

APPENDIX A

For a more complete record for our research may we have the following questions answered.

1. Does your child have allergies? If yes, please explain.
2. Has your child had upper respiratory, nasal, or tonsil and adenoid problem? If yes, please explain.
3. Was your child breast or bottle fed? Approximately how long was she fed by breast or bottle?
4. Did child have a pacifier, blanket, stuffed animal, or thumb/finger sucking habit? If so, please explain, and approximate length of time.

Parent Approval

_____ has our permission to participate in the speech research project.

Parent signature

Date

Instructions: Within the brackets write the phonetic symbol for the sound deep tested, e.g. [s]. Use the symbols you prefer to indicate whether the sound was articulated correctly or the nature of the incorrect articulation (substitution, omission, or distortion) for each of the indicated phonetic contexts. Not all phonetic contexts can be tested. To determine the percent of correct articulations, divide the number of correct responses by the number of phonemes tested and multiply the quotient by 100.

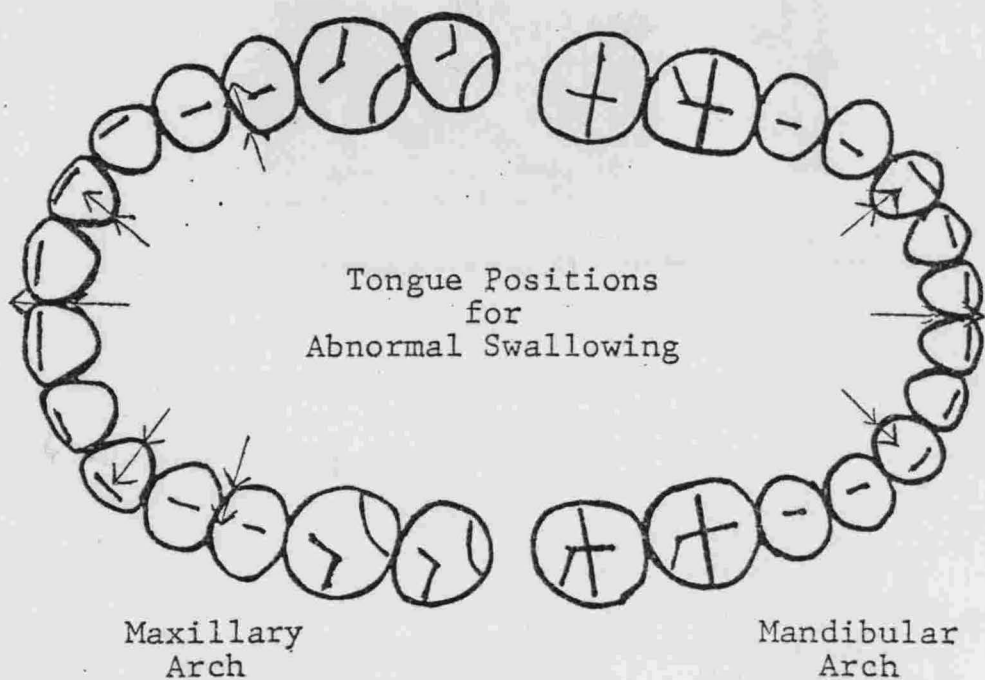
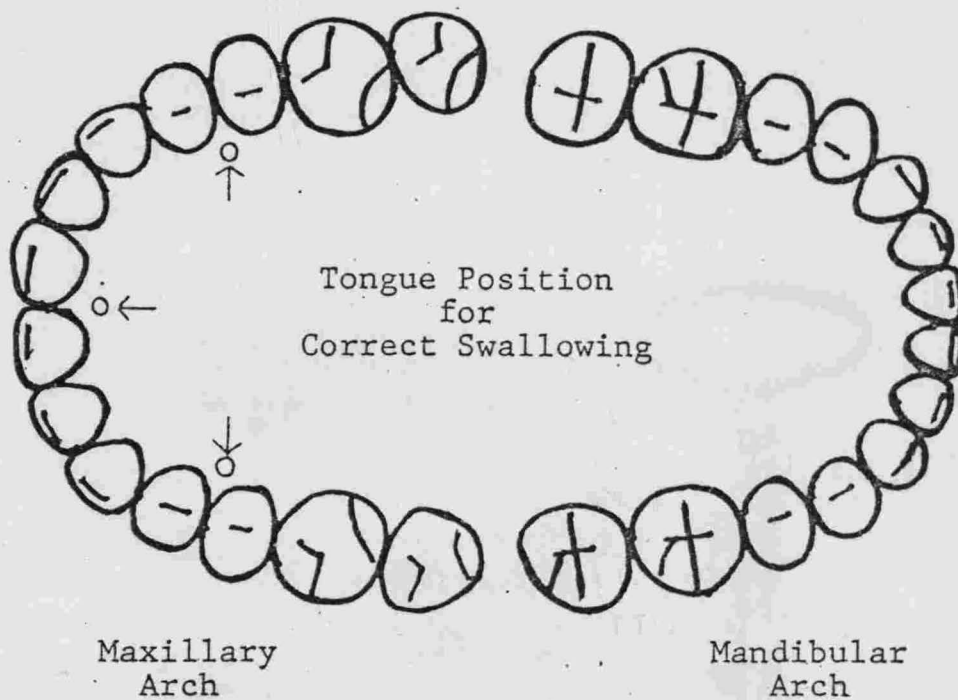
INDIVIDUAL RECORD SHEET for a DEEP TEST OF ARTICULATION

Name _____	Age _____	Grade _____	Date _____	Address or School _____	Tester _____	Test used: _____	Picture _____	Sentence _____
[]								
*								
p — 1 — p	p — 1 — p	p — 1 — p	p — 1 — p	p — 1 — p	p — 1 — p	p — 1 — p	p — 1 — p	p — 1 — p
b — 2 — b	b — 2 — b	b — 2 — b	b — 2 — b	b — 2 — b	b — 2 — b	b — 2 — b	b — 2 — b	b — 2 — b
t — 3 — t	t — 3 — t	t — 3 — t	t — 3 — t	t — 3 — t	t — 3 — t	t — 3 — t	t — 3 — t	t — 3 — t
d — 4 — d	d — 4 — d	d — 4 — d	d — 4 — d	d — 4 — d	d — 4 — d	d — 4 — d	d — 4 — d	d — 4 — d
k — 5 — k	k — 5 — k	k — 5 — k	k — 5 — k	k — 5 — k	k — 5 — k	k — 5 — k	k — 5 — k	k — 5 — k
g — 6 — g	g — 6 — g	g — 6 — g	g — 6 — g	g — 6 — g	g — 6 — g	g — 6 — g	g — 6 — g	g — 6 — g
m — 7 — m	m — 7 — m	m — 7 — m	m — 7 — m	m — 7 — m	m — 7 — m	m — 7 — m	m — 7 — m	m — 7 — m
n — 8 — n	n — 8 — n	n — 8 — n	n — 8 — n	n — 8 — n	n — 8 — n	n — 8 — n	n — 8 — n	n — 8 — n
f — 9 — f	f — 9 — f	f — 9 — f	f — 9 — f	f — 9 — f	f — 9 — f	f — 9 — f	f — 9 — f	f — 9 — f
v — 10 — v	v — 10 — v	v — 10 — v	v — 10 — v	v — 10 — v	v — 10 — v	v — 10 — v	v — 10 — v	v — 10 — v
θ — 11 — θ	θ — 11 — θ	θ — 11 — θ	θ — 11 — θ	θ — 11 — θ	θ — 11 — θ	θ — 11 — θ	θ — 11 — θ	θ — 11 — θ
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u — 29 — u	u — 29 — u	u — 29 — u	u — 29 — u	u — 29 — u	u — 29 — u	u — 29 — u	u — 29 — u	u — 29 — u
ʊ — 30 — ʊ	ʊ — 30 — ʊ	ʊ — 30 — ʊ	ʊ — 30 — ʊ	ʊ — 30 — ʊ	ʊ — 30 — ʊ	ʊ — 30 — ʊ	ʊ — 30 — ʊ	ʊ — 30 — ʊ
%Correct _____	%Correct _____	%Correct _____	%Correct _____	%Correct _____	%Correct _____	%Correct _____	%Correct _____	%Correct _____
Date Tested _____	Date Tested _____	Date Tested _____	Date Tested _____	Date Tested _____	Date Tested _____	Date Tested _____	Date Tested _____	Date Tested _____

*The numbers correspond to the sentence number or picture number in The Deep Test of Articulation

APPENDIX C

Payne Technique Chart

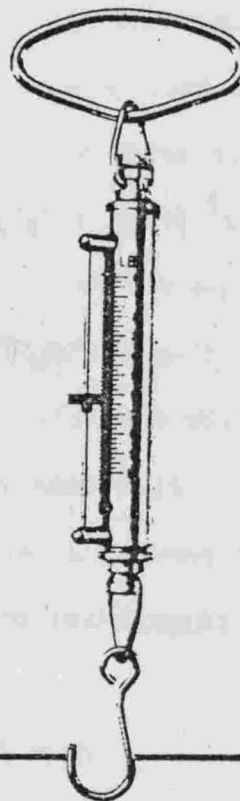


LIP STRENGTH TENSION GAUGE

model
IN-10-MRP

(photo is approx.
40% of actual size)

*Finest quality, non-corrosive brass
scale with numerals and graduations
(both metric and avoirdupois)
deeply embossed, in black. Maxi-
mum reading pointer retains indi-
cation even after tension is released.
For use in measuring myo-
functional exercise progress.*



April 22, 1977

81

Dear

has been selected for a Master's degree research project conducted by Charlene Clark, a graduate student in Speech and Hearing Science at Portland State University.

The project consists of three different methods for working with an anterior lisp (distorted /s/ sounds). The three students selected each demonstrate an anterior lisp and a tongue thrust (a forward movement of the tongue during swallowing and speaking). Each of the three students will be placed in a different management program and will be asked to do some home assignments. A test of articulation will be given at the beginning and the end of the project to assess the change in articulatory patterns for the /s/ sound. Because the program is limited in time, (students will be seen twice weekly for six weeks), we cannot predict changes that will occur. However, on completion of the project, follow-up letters will be sent to you, to the school, and to Mrs. Joanne Smithpeter, the Speech Pathologist who originally screened your child for speech.

Thank you very much for allowing me to work with . If you have any questions please feel free to call me. My phone number is 646-1475 and I'm available any evening except Wednesday. You are also welcome to sit-in on any therapy session.

Sincerely,

Charlene Clark
Charlene Clark

Project Supervisor

Robert H. English
Dr. Robert English

APPENDIX F

HOME CHECKLIST

(to be filled in by parent)

- _____ Has trouble producing certain speech sounds. If yes,
please list the sounds you feel are incorrect.
- _____ Sits with mouth open/closed while watching TV.
- _____ Sits with mouth open/closed while reading.
- _____ Sits with mouth open/closed while doing homework.
- _____ Swallows at mealtime are noisy/noticeable/no problem.
- _____ Sleeps with open/closed mouth.
- _____ Chews food with/without "slurping" noises.
- _____ Listens to conversation with mouth open/closed.
- _____ Tongue is up/down most of the time.
- _____ Appears to be uncomfortable/comfortable when swallowing.
- _____ Eats solid food easily (meat, carrots etc.).
- _____ Eats fast/slowly.
- _____ Drinks liquids to "wash down the meal".
- _____ Able to swallow pills easily.
- _____ Drinks liquids without "reaching" for cup or glass
with tongue.

PATIENT _____ Date of evaluation _____

Parent's signature _____

APPENDIX G

INITIAL/FINAL CONSULTATION FORM

Name _____ Age _____ Date _____

Address _____

Reason for referral _____

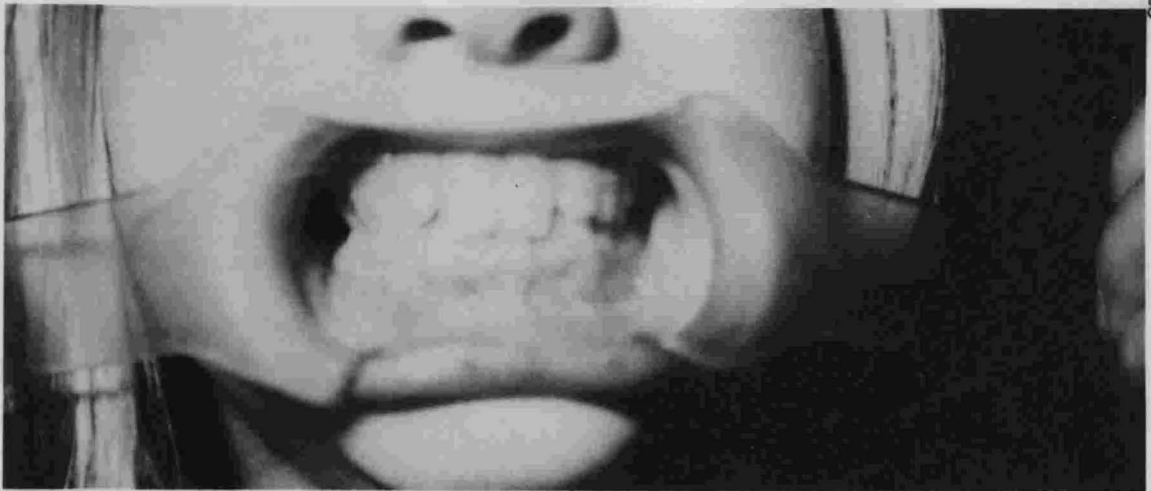
The reason for the referral was to evaluate your speech, oro-facial muscle balance, and/or swallowing habits as they relate to normal speech patterns.

Clinician's examination reveals the following:

1. Speech patterns--good _____ fair _____ poor _____
Specific problem _____
2. Placement of tongue during swallowing as revealed by the Payne Technique.
3. Lip strength _____ lbs.
4. Masseter action--good _____ fair _____ weak _____
5. Mentalis muscle--over developed _____ normal _____ weak _____
6. Is a mouth breather _____ Is not a mouth breather _____

RECOMMENDATIONS:

1. Initiate speech intervention _____
2. Initiate myofunctional therapy _____
3. Initiate speech and myofunctional therapy _____



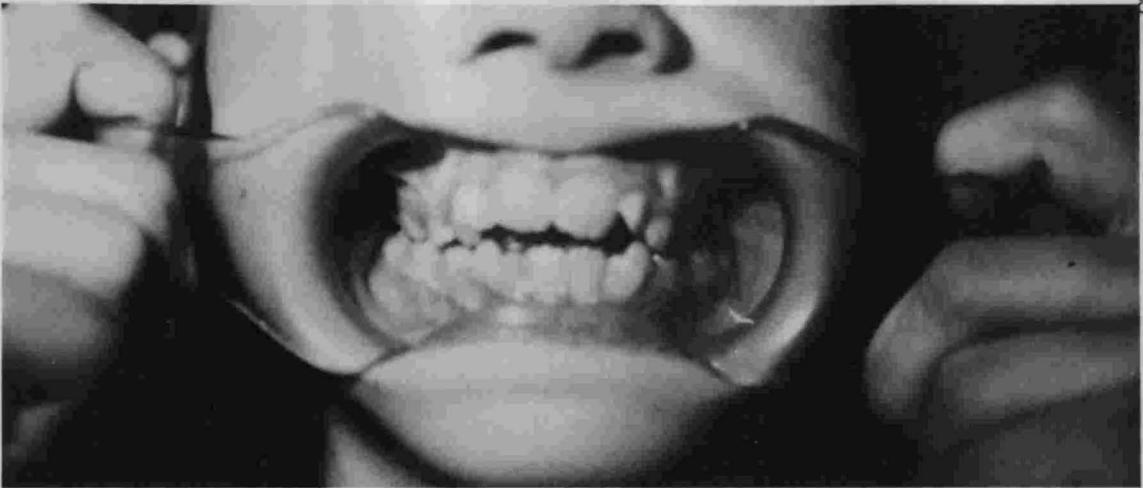
Normal Occlusion



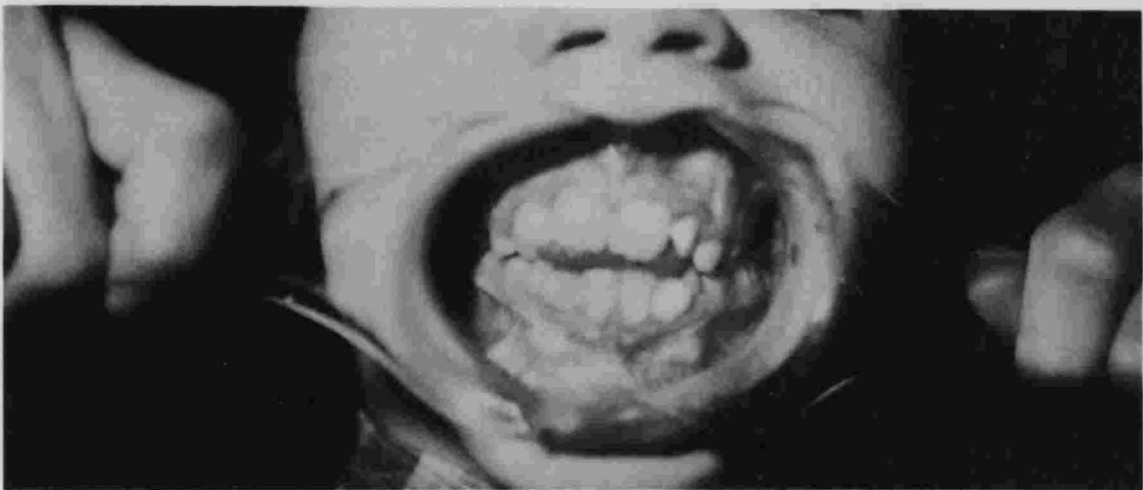
Sustained /s/



Swallowing



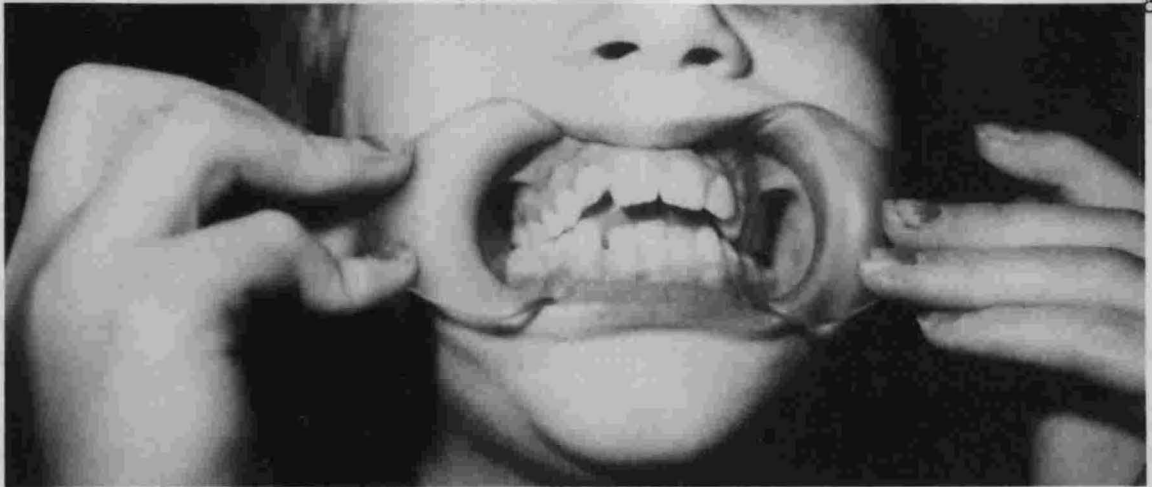
Normal Occlusion



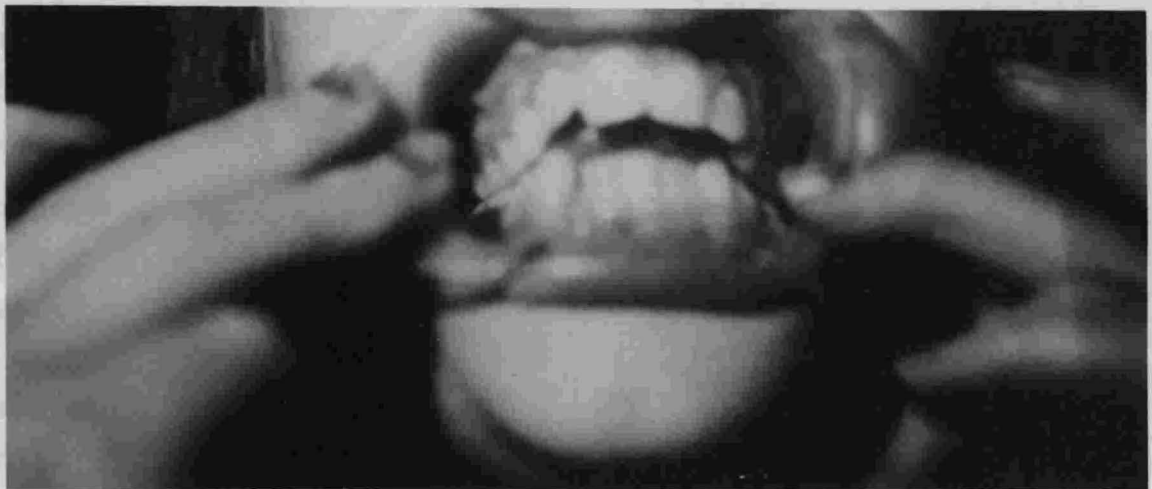
Sustained /s/



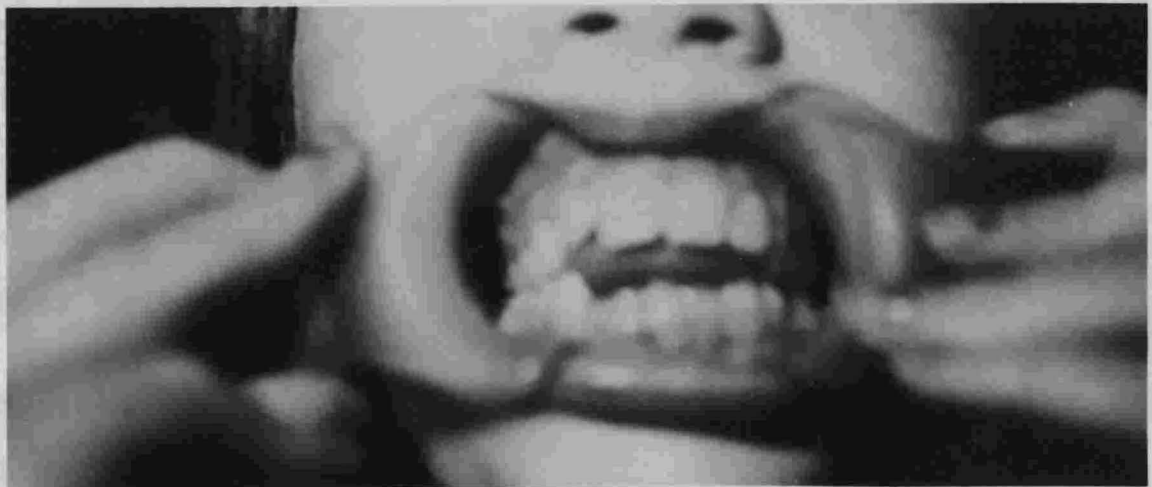
Swallowing



Normal Occlusion



Sustained /s/



Swallowing

APPENDIX K

Practice Sheet
/s/ medial position

ah s ah
ay s ay
ee s ee
i s i
o s o
oo s oo

ahsah
aysay
eesees
isi
oso
oosoo

Busses

Busses moving in the rain.
Motors missing,
Tires hissing,
Busses moving in the rain.

Lucy	pussy	Tessie
see-saw	bossy	acid
lesson	saucer	basin
aces	Bessie	loosen
busses	Lassie	guesser
icy	bicycle	kissing
sissy	messy	faces
lacy	races	nicer
sea-side	facing	pencil
racer	pieces	fancy

Pussy

Here, Pussy, here, Pussy
Run home to me.

Here, Pussy, here, Pussy
Diddle dee dee.

Sissy

A sissy wears
A lacy shirt
And never dares
To touch the dirt.

My cake has yellow icing.
I need a pencil to do my lessons.
The saucer is broken in pieces.
That boy is bossy.
Don't make faces at a policeman.
The busses are coming late.
She has a fancy, lacy dress.
Where is the pussy cat?
Lassie is a nice dog.
Play your aces first.

Races

I go to air races,
To see all the aces
Fly jets in the air so high.

The faster their paces
The whiter their traces
Against the blue, blue sky.

Busses

Busses moving in the rain,
Motors missing,
Tires hissing,
Busses moving in the rain.

Bicycle

I was on my bicycle
Racing down the lane.
I tried to get my bicycle
To keep up with a train.

APPENDIX M

List of Research Committee's
:
Test Sentences

1. Sam helped a passenger get on the bus.
2. The zoo isn't the home for cows.
3. It's zero and I'm freezing in this breeze.
4. We saw a seesaw on the grass.

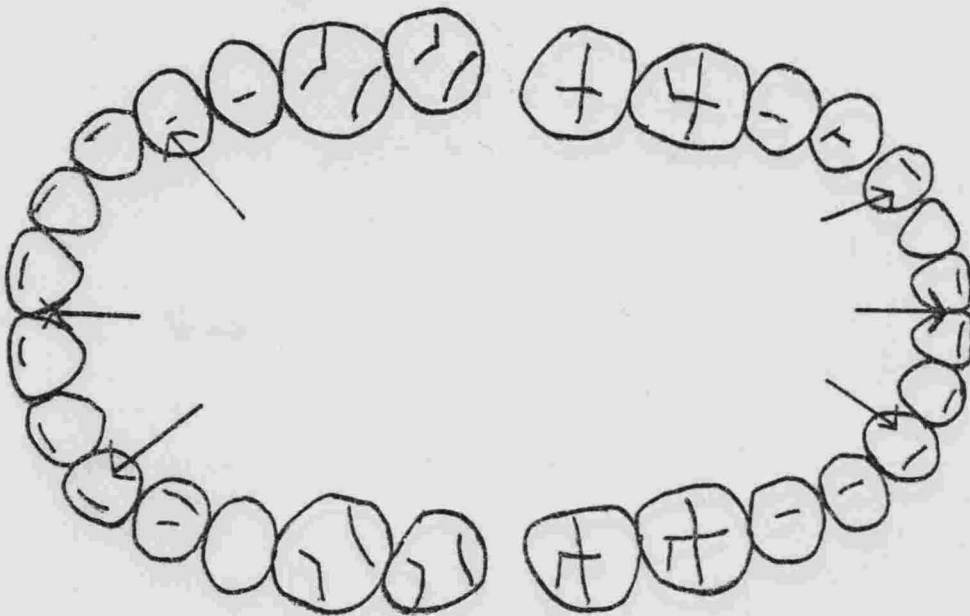
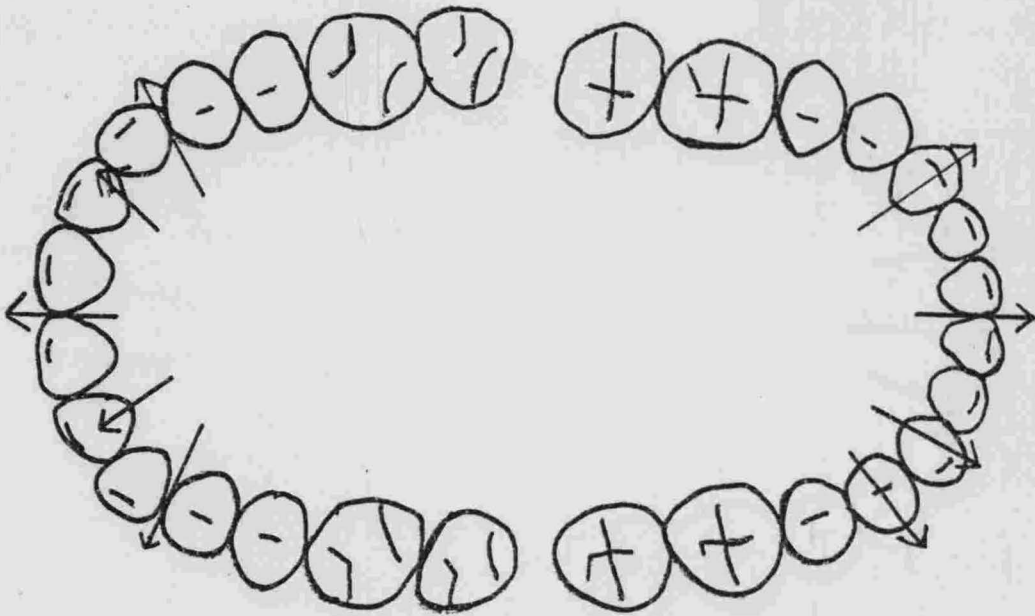
Test sentences were given in random order and independently to each individual client by two research committee members.

Payne Technique Chart

4 / 22 / 77

Dawn - Client A

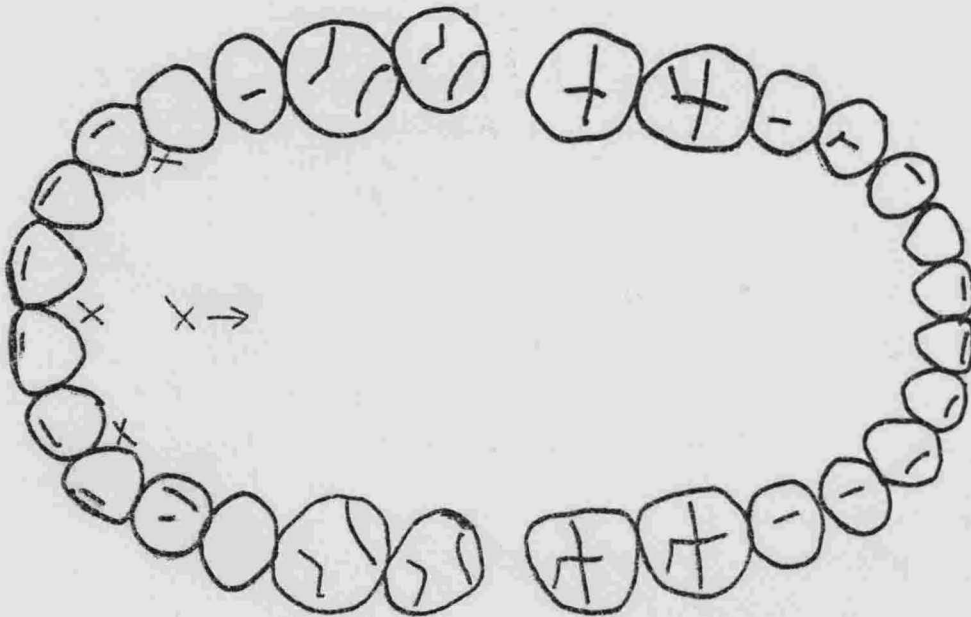
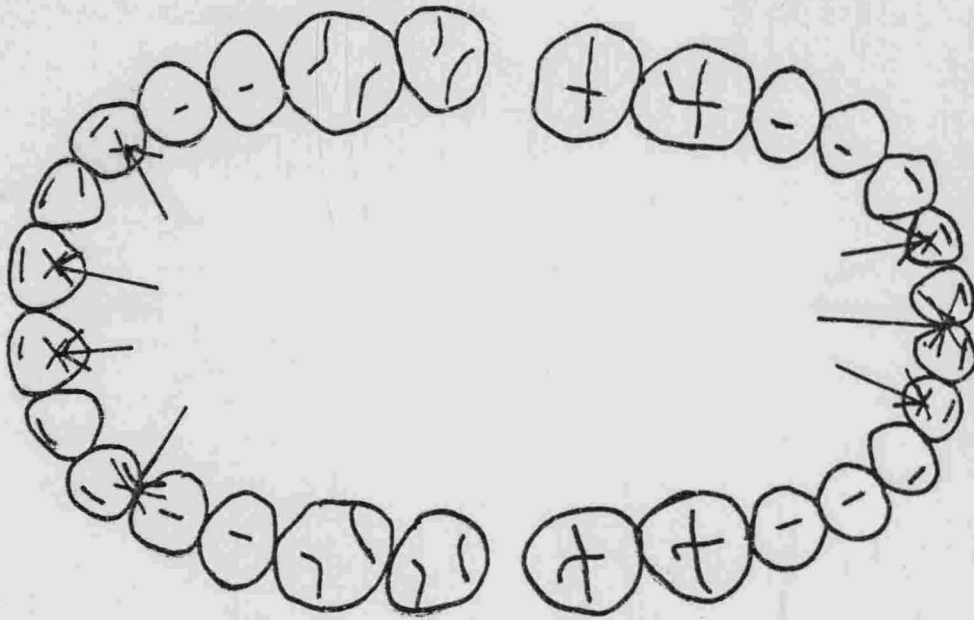
5 / 24 / 77



4/22/77

Jeannie-Client B

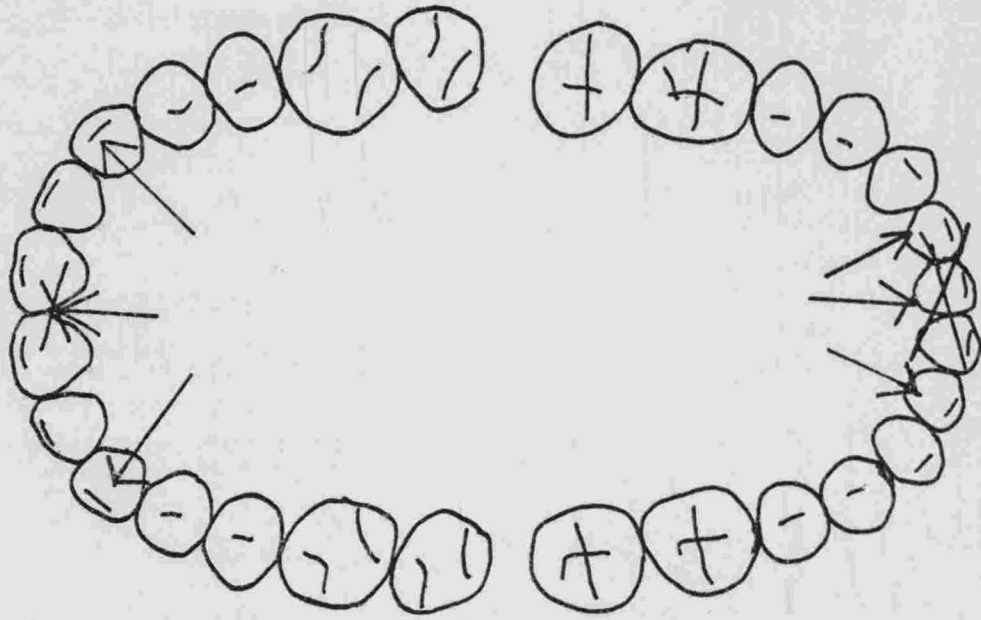
5/24/77



Payne Technique Chart

4 / 22 / 77

Lori-Client C



5 / 24 / 77

