

Oral-Motor Techniques in Articulation and Phonological Therapy

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Revised 2001

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Oral-Motor Techniques in Articulation and Phonological Therapy
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Dedication

This book is dedicated to Dr. Suzanne Evans Morris for her pioneering research on feeding development, disorders and treatment, and her immeasurable influence on me as a therapist, lecturer and writer. Dr. Morris' insights into feeding and oral-motor therapy have been and continue to be the cornerstone upon which the entire field of oral-motor therapy for children has been constructed.

Dr. Morris, I hope you find this book acceptable and worthy.

Introduction

I have been encouraged for many years to write this book, and I am happy to be able to do it finally. This book is about oral-motor therapy, as it has been and continues to be practiced by thousands of speech-language pathologists, occupational therapists and physical therapists worldwide. I am glad to have been part of a movement which began humbly enough as an outgrowth of the need to do something more than traditional articulation and phonologically-based therapy. Oral-motor therapy has grown to be the “hot topic” of the 1990’s, and it looks to be a strong component of treatment well into the next millennium.

I have taught the information contained in this volume to tens of thousands of speech and language pathologists from 1982 until the present. Time and again I have noted that many therapists cannot “see” an oral-motor problem at first. Over time, with training and experience, the eyes are trained to see that which has been occurring in children with articulation disorder all along.

As an early writer in our field once noted, “Speech is movement made audible.” This is so true: speech is movement of four primary subsystems, namely, the respiratory, phonatory, resonatory and articulatory mechanisms. Articulation is accomplished through movements of the jaw, the lips and the tongue. A thorough understanding of these oral movements, therefore, is integral to our understanding of articulation and phonological development, delay, disorder, diagnosis and treatment.

Learning how to assess and treat oral movement problems is a process of studying, watching, listening and doing as skill comes with practice over time. Readers who are first learning oral-motor therapy are encouraged to work with other therapists who already have some amount of expertise in this field and to watch videotapes of treatment. Therapists will begin to understand jaw, lip and tongue control by watching many clients over several years. At some point most therapists are able to say with certainty, “This is an oral-motor problem,” and “These techniques are working to facilitate improved oral-motor and articulation development.”

Please Note: In the spirit of simplicity, male pronouns (he, him, his) will be used throughout the text to refer to the client.

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Chapter 1

Introduction to Oral-Motor Therapy

Chapter Contents

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Oral-motor therapy became the “hot topic” in speech and language therapy in the 1990’s despite the fact that there had been no formal research initiated, no textbooks written, and no courses taught at the university and college level. Oral-motor therapy had evolved through grass roots efforts on the part of many practicing speech-language pathologists who designed the ideas and began to teach them through continuing education programs.

This book presents basic information about oral-motor therapy as it is being practiced today. It includes information on the jaw, lips, tongue and the oral-tactile system. Aspects of “normal” mature oral-motor control are discussed as are ideas about development, disorder, assessment and treatment.

We begin our discussion in this first chapter with concepts about movement and its relationship to speech. In it we discuss what oral-motor therapy is, who uses it and how it is used, and we explore basic issues of diagnosis, goal-setting and treatment.

Speech is Movement

The most foundational concept of this text is that speech is movement made audible. Speech is movement of the respiratory system, the phonatory system, the resonatory system and the articulatory (meaning jaw, lips and tongue) system. Speech and language pathologists typically study the anatomy of these four subsystems of speech by learning their component parts — bones, muscles, nerves, skin — without studying movement itself. Yet it is the movements of these subsystems which allow speech to arise.

In this book we shall explore aspects of movement as they apply to the oral movements necessary for articulation and phonological skill. We shall discuss: (1) how movement is organized, (2) how movement develops over time, (3) how movement breaks down when there is disorder or delay, (4) how one inhibits abnormal movements, and (5) how one facilitates improved movements.

Definition of Oral-Motor Therapy

Oral-motor therapy, as it is practiced today, can be defined as the process of facilitating improved oral (jaw, lip, tongue) movements.

Purpose of Oral-Motor Therapy

The purpose of oral-motor therapy is to establish satisfactory and satisfying oral experiences. The term *satisfying* refers to the client. In the ideal situation, oral-motor training is done in a loving and caring environment in which clients gradually are introduced to the materials and techniques. Oral-motor training should be pleasurable and engaging for the client. It generally does no good to “force” oral-motor techniques on a client. He may come to hate them, may come to reject the therapist and may develop extreme tactile defensive behavior.

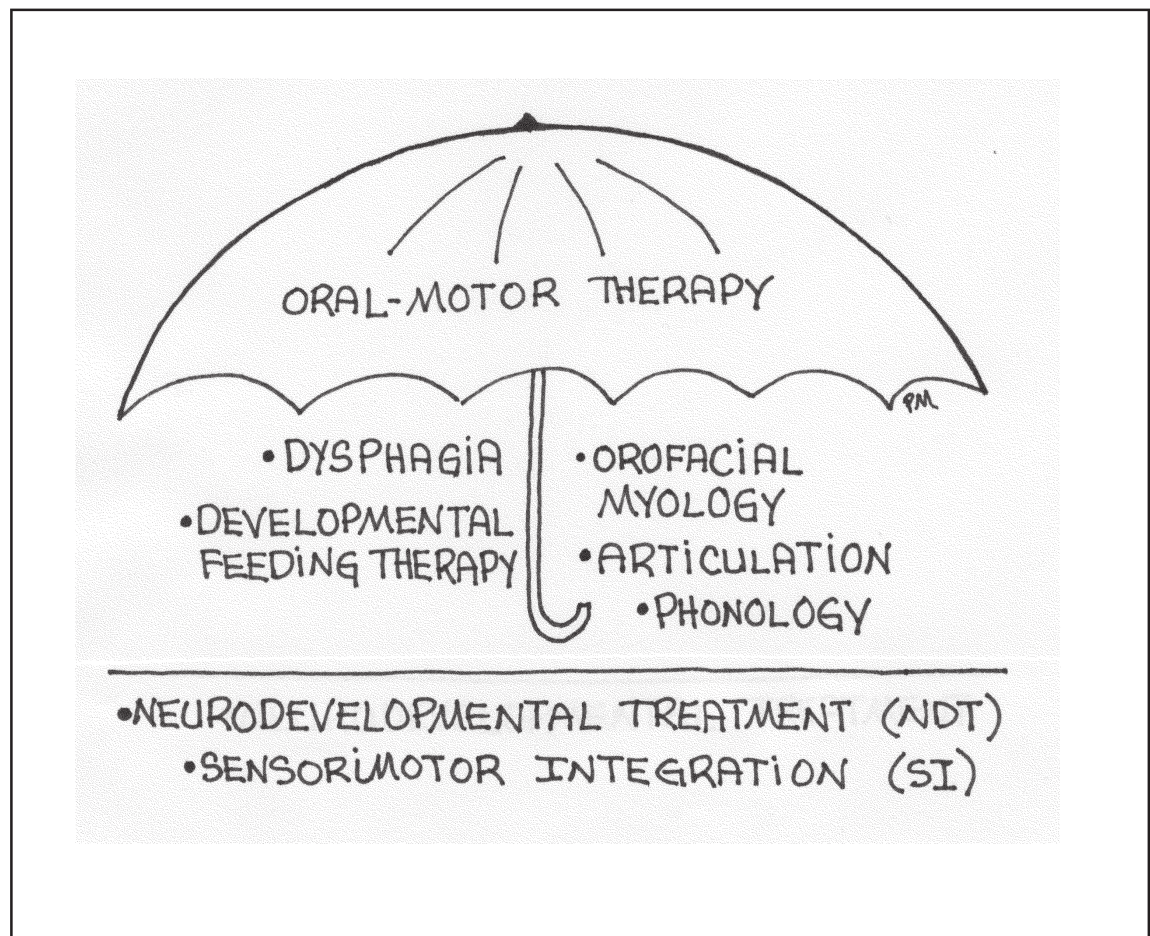
The term *satisfactory* refers to the therapist’s need to be satisfied that the program and its techniques are moving a client toward more “normal” oral movement control. In therapy, fun and games themselves do not meet this specification, and neither do “oral exercises” which have no purpose. Activities in which it is clear that a client is gaining oral awareness and appropriate oral-motor control, however, do meet the criteria to make therapy satisfactory.

Primary Goal of Oral-Motor Therapy

The primary goal of oral-motor therapy is to facilitate improved oral (jaw, lip, tongue) movements.

Therapies That Incorporate Oral-Motor Techniques

There are six treatment areas today in which oral-motor techniques are utilized: (1) articulation and phonological therapy, (2) dysphagia therapy, (3) developmental feeding therapy, (4) orofacial myofunctional therapy, (5) neurodevelopmental treatment and (6) sensorimotor integrative therapy. There also has been some evidence that oral-motor techniques are being used in massage therapy and in therapies involving craniofacial manipulation.



Goals of Six Treatment Areas

As stated above, oral-motor goals and techniques are interwoven throughout at least six different treatment regimes today. The goals of treatment for these areas are different but overlapping, and each includes oral-motor therapy in its daily practice.

1. **Dysphagia Therapy:** The goal of dysphagia therapy is to facilitate improved oral function for eating and swallowing when that function has been lost due to injury, neurological insult or disease processes. Oral-motor techniques are used to help achieve this goal.

2. **Developmental Feeding Therapy:** The goal of developmental feeding therapy is to facilitate improved oral function for eating, swallowing and oral exploration (including prespeech vocal play) when the normal developmental process has been or is being interfered with by congenital factors. Oral-motor techniques are used to help achieve this goal.

3. **Orofacial Myofunctional Therapy:** The goals of orofacial myofunctional therapy are to facilitate improved oral function in order to: (a) eliminate tongue thrust, (b) prevent functional increase in open bite or overjet, (c) improve patient's facial cosmetics, (d) sometimes move teeth slightly toward normal occlusion, and (e) help assure stability of correct occlusion. Oral facial myologists also provide therapy programs to eliminate oral sucking and licking habits. Oral-motor techniques are used to help achieve these goals.

4. **Articulation and Phonological Therapy:** The goals of articulation and phonological therapy are to facilitate improved oral function for better speech sound production and speech sound sequencing. Oral-motor techniques are used to help achieve these goals.

5. **Neurodevelopmental Treatment (NDT):** The goals of neurodevelopmental treatment are to inhibit abnormal reflex activity and to facilitate normal movement patterns in the whole body of which the oral mechanism is one part. Oral-motor techniques are used to help achieve these goals.

6. **Sensorimotor Integration Therapy (SI):** The goals of sensorimotor integrative therapy are to facilitate better organization and processing of sensory information from the different sensory channels, and to facilitate better ability to relate input from one channel to that of another in order to emit an adaptive response. Oral-motor skills are adaptive when we use them for eating or speaking. Oral-motor techniques are used to help achieve these goals.

Additional Areas: There are a few additional therapies in which oral-motor techniques have been included to a lesser extent. These include craniosacral manipulation, general massage therapy and acupressure.

General Goals of the Oral-Motor Program in Articulation and Phonological Therapy

The following general goals are ones which support the primary goal of facilitating improved oral movements in articulation and phonological therapy. They can be applied broadly to most clients.

1. To increase awareness of the oral mechanism and its parts.
2. To normalize oral-tactile sensitivity.
3. To inhibit “abnormal” and to facilitate “normal” oral movement patterns.
4. To increase differentiation of oral movements.
5. To achieve successful speech sound production.

Oral-Motor Therapy for Speech Is Not Feeding Therapy

As stated above, oral-motor therapy is a process of facilitating improved oral function. The techniques involved in the process can and are used in a variety of treatment regimes including feeding therapy. Oral-motor therapy as it is described in this book, however, is not feeding or swallowing therapy, and it is not intended to diagnose or treat significant feeding or swallowing problems. Readers are warned not to think of or use this book as their source of information about feeding or swallowing disorders and treatment.

Clients with feeding and swallowing disorders have health-related issues around feeding. They are *feeding-impaired* and their life and health are at risk. Feeding therapy for these clients goes well beyond simple techniques to facilitate improved jaw, lip and tongue movements. It also includes procedures regarding: (1) food and liquid preparation, (2) the use of modified bottles, cups, spoons, etc., (3) working through food texture, taste and smell groups, (4) techniques to normalize oral-tactile sensitivity and (5) procedures to facilitate better family function at mealtimes.

Children with mild-to-severe articulation and phonological deficits typically do not have feeding disorders which put their health or life at risk, and, in the traditional articulation and phonological literature, these children have not been identified as having feeding problems at all.

To the modern therapist skilled in feeding therapy, however, it is obvious that many of these children do have mild-to-moderate feeding problems. However, these children eat enough, their families are not concerned with feeding, and their health is not at risk.

I affectionately call children with subtle feeding problems *snack impaired*. These children can benefit from feeding activities and techniques which will improve their overall eating skill, but the sole purpose for including oral-motor techniques in their treatment is to facilitate improved speech. Programs and goals are designed and written to address their speech skills.

Relationship Between Speech and Swallowing

When oral-motor therapy was in its infancy, there raged a controversy around the following question: Do swallowing problems cause speech problems or vice versa? At the time, we were seeking a causative relationship between speech and swallowing to determine if therapy toward one would effect changes in the other. Perhaps, the thinking went, if we did the right type of swallowing therapy, we would eliminate the need for speech therapy.

The question itself revealed inadequate information about the nature of the relationship between the oral movements needed for speech and those needed for eating and swallowing. This relationship is not causative — feeding or swallowing problems do not CAUSE speech problems or vice versa — but the movements for each are interrelated.

We can understand this relationship between speech and swallowing when we understand how all movements are related. To illustrate this relationship, let's consider movements of the hands.

The hands (with the fingers) are able to perform many movements for use in a variety of functions. For example, our hands can hold objects, fasten buttons, cut with scissors, draw with writing utensils, poke into holes or soft substances, pull on objects, as well as signal and sign.

These sample hand movements are related to one another in that each requires a certain amount of hand and finger control. The movements themselves, however, do not cause problems for one another.

For example, problems in buttoning do not CAUSE problems in scissoring. Even on the surface this idea seems ridiculous. A child's inability to button does not CAUSE his inability to scissor; instead, poor hand and finger control cause him to have difficulty with both buttoning and scissoring. Poor buttoning and scissoring are related because each are the RESULT of poor hand and finger control. It is the poor hand and finger control which causes difficulty in both buttoning and scissoring.

Likewise, swallowing problems DO NOT CAUSE speech problems or vice versa. Both speech movements and swallowing movements are functional ways we use the mouth's

movement abilities. Speaking and swallowing are related to the mouth just as buttoning and scissoring are related to the hands. Poor speaking and swallowing can be the RESULT of poor control of oral movements.

Poor oral control can cause problems in at least four functional areas: (1) speaking (articulation), (2) eating and swallowing (feeding), (3) imitating oral movements and postures, and (4) resting the oral mechanism (oral rest position). Oral-motor therapy provides therapy methods and techniques designed to facilitate improved oral movement for any of these four problem areas.

Diagnosing Oral-Motor Problems

Although this is a text on treatment and no formal evaluation tool is included, a few introductory comments about assessment should be made. The oral-motor exam goes far beyond the standard oral (oral-peripheral) exam in which structure is examined. It also goes beyond a simple checklist of the client's ability to perform selected oral movements or postures.

The oral-motor exam is an examination of habitual oral movement patterns which occur during: (1) speaking, (2) eating, (3) while imitating oral postures and movements, and (4) while engaged in other activities in which the mouth should be held at rest. These four habitual oral movement activities are the foundation of the exam.

The assessment of oral-motor abilities is almost exclusively visual. Since speech-language pathologists have been primarily trained to assess their clients' speech abilities through the auditory channel, it can take many months or years to learn to assess an oral-motor deficit completely and efficiently. By studying "normal" oral-motor control and the problems which occur in oral-motor deficits, one gradually comes to an understanding of what "normal" oral-motor control should look like.

Throughout the text information about "normal" jaw, lip and tongue control is presented. Readers can use this information to begin the evaluation process.

General Versus Specific Oral-Motor Therapy

Oral-motor therapy is like any other therapy: it is a process of treatment designed to help facilitate changes over time. Some oral-motor therapy is designed to facilitate improved overall functioning and maturity of the oral-motor system. This is referred to as *general oral-motor therapy*. General oral-motor therapy is incorporated into a client's overall speech and language program. It is a process of change which takes place over a long period of time consisting of several months or years.

General oral-motor therapy might be used, for example, in an articulation/phonology/feeding program for a young child with Down's Syndrome. This oral-motor program might include the following goals: (1) to increase awareness, differentiation and control of oral movements, (2) to normalize oral-tactile sensitivity, (3) to increase overall oral tone, (4) to increase jaw mobility, (5) to establish jaw stability, (6) to facilitate development of tongue-tip elevation and (7) to facilitate development of tongue back elevation. These goals, embedded within the client's articulation and phonological program, might blanket a treatment program of one, two or even more years.

Specific oral-motor therapy, on the other hand, is designed to use a specific type of stimulation in order to facilitate the emergence of a specific oral-motor movement for the production of a specific phoneme. Specific oral-motor therapy also is incorporated into a client's overall speech and language program.

Specific oral-motor therapy might be used, for example, in an articulation program for a child with a persistent distorted /l/. This oral-motor program might include the following goals to stimulate /l/: (1) to stabilize the jaw in a partially-open position for production of /l/, (2) to increase tone in the tongue for production of /l/, (3) to facilitate consistent tongue-tip elevation for production of /l/, and (4) to normalize oral-tactile sensitivity. These goals might be used during a few days, weeks or months of treatment.

The Inclusion Rule of Oral-Motor Therapy

Oral-motor therapy is incorporated INTO a program of articulation and phonological therapy. An oral-motor therapy program is not initiated as a means to itself; therefore, one does not eliminate other aspects of a client's articulation or phonological program in favor of doing oral-motor therapy alone. One utilizes oral-motor techniques as one engages in a program of articulation and phonological treatment.

Exercises, Cues and Stimulation Techniques

Techniques to facilitate improved oral function come in three types: exercises, cues and stimulation techniques. Various programs of oral-motor training usually are based on one or more of these types.

1. Exercises: Exercise is bodily exertion for the sake of training. When we use oral-motor exercises in therapy, we exercise movement, and an oral movement can be exercised after it has been learned. Exercises are excellent components of oral-motor training because they help clients become more familiar with movements they already can perform. There are four types of exercises which are common in oral-motor therapy.

A. Repeating Movements: Some oral-motor exercises are designed to have the client perform a movement and then repeat it multiple times. For example, when we ask a client to lift the tongue-tip to the alveolar ridge ten times in a row, we are asking him to repeat a movement. Repetition of movements increases awareness, voluntary control, strength, skill and fluency of movement. We ask clients to repeat desired movements, and we avoid having them repeat undesired movements.

B. Maintaining Postures: Some oral-motor exercises are designed to have the client perform an action and then hold the resultant posture for increasing lengths of time. For example, when we ask a client to lift the tongue-tip to the alveolar ridge and hold it for a count of ten, we are asking him to maintain a posture. Maintaining a posture also increases awareness, voluntary control, strength and skill of movement. We ask clients to maintain desired movements, and we avoid having them maintain undesired movements.

C. Lifting Weights: Athletes lift weights to make muscles work harder for movement. We can add weight to oral movement through resistance. Resisting movement also increases awareness, voluntary control, strength and skill of movement. We have clients resist desired movements, and we avoid having them resist undesired movements.

D. Stretching Muscles: Athletes stretch muscles to “warm up” — to increase blood flow and resultant oxygen exchange within a muscle, and to release pent-up energy. We can stretch the oral mechanism by opening the mouth wide, by sticking the tongue far out, by performing big oral movements and by massaging the face.

2. Cues: A cue is used to remind a client of movement. Cues can be paired to a newly learned movement and then used afterward to remind the client to use it. Cues are excellent components of oral-motor training because they can be used to teach new oral movements and they will help clients remember to use already-learned ones. Cues come in three basic types:

A. Hands-On Oral Cues: Hands-on oral cues are touch cues which therapists do on a client’s face. Hands-on oral cues teach clients what to move as well as the direction and extent of movement. For example, when we touch the upper and lower lip gently and ask the client to “close your lips” we are giving a cue. Cues do not stimulate new movement to arise necessarily, however they can be used to teach new movements, and they can remind clients what to do. The original Motokinesthetics method is an external oral cuing system, as is the P.R.O.M.P.T. method.

B. Modeled Oral Cues: Sometimes therapists use cues on their own faces to get clients to pay attention to how sounds are made. For example, we can point toward our rounded lips with the index finger to remind a client to round his lips. Modeled oral cues are an excellent addition to oral-motor therapy. They can be used to teach new movements and to remind clients of old ones.

C. Cues on the Rest of the Body: Sometimes we cue an oral movement by motioning somewhere else on the body. For example, we might tickle the arm to remind the client to produce prolonged stridency, or we might snap our fingers to remind a client to make a stop consonant very quickly. Body cues are excellent additions to articulation and phonological therapy since they help remind clients to perform newly learned oral movements.

3. Stimulation Techniques: Techniques which utilize tactile and proprioception stimulation to inhibit abnormal movement patterns and to facilitate more normal and more advanced movements are known as stimulation techniques. For example, when the tongue is completely immobile due to high muscle tone, stimulation can be given to reduce (inhibit) the tone and to encourage (facilitate) more appropriate and advanced tongue movements.

Stimulation techniques are the most powerful of an oral-motor program because they do more than simply exercise or remind a client of a movement they have learned. Stimulation techniques cause new movement to arise. This book is primarily concerned with stimulation techniques.

Exercises, cues and stimulation techniques can be used together to create a rich oral-motor learning environment for articulation and phonological training: (1) inhibition techniques take away the influence of unwanted movements, (2) facilitation techniques create new or more advanced movements, (3) cues are paired with stimulation to remind clients of newly created movements, (4) exercises are paired with cues so that over time the cue can be faded in deference to the exercise, and (5) once a client can repeat an oral movement on demand in exercise or drill fashion, he is ready to use it for the production of speech sounds.

Power of Stimuli

Inhibition and facilitation techniques are accomplished through the use of stimuli, or items used to stimulate, and stimuli are graded by their "power." The power of the stimuli refers to the influence an individual stimulus item will have on muscle contraction, tactile perception and oral movement.

Power is regulated by texture, temperature, taste, smell, vibratory nature, rate of presentation and pressure applied. Thus, individual objects in oral-motor therapy can be used in various ways and for various purposes depending on the amount of power given to them and the ways in which they are employed.

For example, a tongue depressor by itself is an item of little power. It is of little texture and is relatively neutral in temperature, taste and smell. A flavored tongue depressor has

slightly more power because it is flavored, but an object such as a toothette dipped into cold applesauce will be even more powerful because it is textured, flavored and cold.

The amount of power employed in treatment is regulated by the response to the stimuli given by the client.

Hands-On Versus Hands-Off Treatment

Oral-motor therapy evolved first as a hands-on treatment program, meaning that the techniques primarily were done by therapists with their hands on clients' faces and in their mouths. Over the years, a process I like to call hands-off techniques has evolved. Hands-off techniques are those which do not require therapists to put their hand on or in a client's mouth. They depend instead on the use of toys and tools in treatment which the client can use himself. For example, hands-off techniques are preferable for groups and in situations where "scrubbing and gloving" (see below) are not possible. Both hands-on and hands-off techniques are presented in this text.

Following Sanitary Procedures

Because oral-motor therapy entails the use of hands-on and hands-off techniques, sanitary procedures are a basic practice in oral-motor therapy.

1. "Scrubbing and Gloving"

Therapists must adhere to the following hand sanitation procedures at all times when touching a client's oral mechanism either for diagnosis or treatment. We call this "scrubbing and gloving."

- A. Wash with a sanitizing soap.
- B. Dry with a paper towel and dispose of it, or dry with a cloth towel and place it in the laundry.
- C. Slip hands into latex or vinyl gloves.
- D. Rinse excess powder from gloves.
- E. Work with the client.
- F. De-glove and dispose of gloves (one use only).
- G. Wash the hands again with a sanitizing soap.

Warning! Recent studies have demonstrated that clients and therapists alike can have or can develop strong allergic reactions to latex. Some of these reactions can be life-threatening. Questions about latex allergies should be a part of the initial assessment of a client with oral-motor deficit, and vinyl gloves should be substituted when allergies are noted or suspected. Many therapists opt for exclusive use of vinyl gloves for this reason.

2. Sanitizing Toys and Tools

The following guidelines must be followed when using objects on, in or around the mouth:

1. Wood objects must be used only once and then disposed of. (E.g., tongue depressors, craft sticks).
2. Paper and cardboard objects must be used only once and then disposed of. (E.g., paper towel tubes, lollipop sticks, toothettes).
3. Sponge objects must be used only once and then disposed of. (E.g., Toothettes, Ora-Swabs).
4. Cotton objects must be used only once and then disposed of. (E.g., glycerine swabs, cotton balls).
5. Plastic toys and tools can be used multiple times by the same client. Wash and dry after each session. (E.g., Bitesticks, whistles, horns, straws, etc.).
6. Rubber toys and tools can be used multiple times by the same client. Wash and dry after each session. (E.g., teething toys, Nuk massage brushes, etc.).

Length and Duration of Treatment

The length and duration of oral-motor treatment depends upon the nature and severity of the oral-motor dysfunction. The nature of the disability has to do with whether the oral-motor problems are the result of simple delay or more complex disorder.

1. Delay

In the case of simple delay, therapy should accelerate acquisition of oral-motor skill, and the ultimate goal in treatment can be to reach “normal” functioning. Length of treatment will vary depending upon how significant is the delay.

When delay is slight, such as in the case of mild articulation error on later-developing phonemes, significant changes in oral control can be seen right away — within a few sessions. In such cases, oral-motor skills will have been almost completely mature from the onset, and therapy will be a very small part of the client’s initial articulation program. Oral-motor techniques may be used simply to train correct production of the specific error phoneme(s).

When delay is severe, however, changes will occur much more slowly. In the case of severe phonological impairment resulting in high unintelligibility, for example, changes in oral-motor control may come over the course of a year or more. Factors (such as severe oral-tactile hypersensitivity) may interfere for some time with oral-motor learning. Treatment for oral control can be expected to last through much of the long term of articulation and phonological treatment.

2. Disorder

In the case of oral-motor dysfunction due to neuromuscular disorder or congenital disability, therapy should work to inhibit abnormal oral-motor patterns and to facilitate more normal ones. Reaching complete normalcy, however, might not be possible. The course of oral-motor treatment probably will parallel the long course of articulation and phonological treatment, and the ultimate goal of treatment should be to facilitate the best oral control possible.

Because of the long-term needs of the client with severe oral-motor dysfunction, it is recommended that oral-motor therapy be cycled in and out of treatment on a periodic basis over the long haul of therapy. For example, a client with very low tone and severe cognitive delay may need oral-motor therapy throughout childhood. Oral-motor techniques can be included intensively on a periodic basis, and then eliminated for awhile before returning to them again. Other aspects of the communication program (e.g., work on the augmentative communication system) can be the focus of treatment during these down times.

Oral Rest Position

The term oral rest position is used to describe how the mouth should be positioned when it is at rest, or not engaged in oral movement activity like speaking, eating or imitating. For the purposes of this text, oral rest position is described in the following way:

1. Jaw: The jaw rests slightly downward so that the upper and lower teeth don't touch.
2. Lips: The lips rest gently together.
3. Tongue-tip: The tongue-tip rests gently against the alveolar ridge.
4. Lateral Tongue: The sides of the tongue rest gently on or near the palate.
5. Base of Tongue: The base of the tongue rests low.

Take a moment to observe your oral rest position. The oral rest position is the neutral position of the mouth. It is the position from which all oral movements arise.

Chapter One Summary

In this first chapter we have introduced concepts of oral-motor therapy and presented an introduction to its definition, purpose, goals, diagnosis and general procedures. We have discussed how oral-motor therapy has been and is being used in a variety of therapy programs including articulation and phonological therapy.

In the next chapter, we shall discuss how movement itself is organized and relates to oral-motor control.

Chapter 2

Principles of Movement Applied to the Oral Mechanism

Chapter Contents

1. General Concepts
2. The Organization of Motor Control
3. Sensory Components
4. Patterns of Movement Breakdown

To understand oral movement and oral-motor therapy, one must understand basic concepts about movement itself. The principles of movement selected for this chapter are ones which have been abstracted from a variety of motor therapy procedures. These are some of the basic principles of movement which occupational and physical therapists learn to practice their trades.

The principles have been organized into four basic areas: (1) general concepts, (2) the organization of motor control, (3) sensory components, and (4) patterns of movement breakdown. Each principle is explained, and examples of how the principle applies to whole body movements in general and to oral movements in specific are discussed. Applications to articulation and phonological therapy are made.

General Concepts

In this first section, we present general concepts about motor development.

1. Development is a continuous process from conception to maturity.

Motor skills, including oral-motor skills, develop throughout life and can be refined with practice even through adulthood. For example, physical activity or physical therapy can be beneficial to almost all clients regardless of age. The main exception to this practice is in the case of progressive disease in which case physical exercise may speed severity of dysfunction.

This principle applies to oral-motor therapy. Oral-motor techniques can be beneficial to clients of all ages except for those with progressive disease in which case maintaining highest level of function for the longest period of time is the primary goal. Oral-motor techniques which support this goal can be included in treatment for the patient with degenerative disease.

- Application to Articulation and Phonological Therapy: Oral-motor techniques can be considered for use with all clients regardless of age.

2. The sequence of motor development is the same for all children although the rate may vary from child-to-child.

In normal development, movements progress through a highly predictable sequence which is dependent upon emerging underlying skills. For example, most children sit before they stand, stand before they walk, and walk before they run. Some children acquire these skills very early, while others do so later, but, in general, most children acquire these skills in this sequential order.

Oral-motor skills also progress through a highly predictable sequence, and this is noted in both speaking and eating. For example, in learning to eat, most children suckle-swallow before they swallow, and use the tongue in an anterior-posterior pattern before they do so in a left-right pattern. In speaking, most children learn the oral movements for /b/ earlier than they learn those needed for /r/. This occurs in part because the oral movements required for a bilabial are earlier to develop than the oral movements necessary for /r/. The sequence of oral-motor development contributes to the order in which vowel and consonant phonemes are acquired.

- Application to Articulation and Phonological Therapy: Articulation and phonological therapy should progress in a sequence constructed with information about the development of oral movement control.

The Organization of Motor Control

In this second section, we present information about how movement is organized in development.

1. Movements develop cephalocaudally.

The term *cephalo* refers to the head, and the term *caudal* refers to the tail. Motor specialists describe movements of the body beginning at the top of the spine (near the head) and progressing down the spine toward the tailbone. In this fashion, head and upper back movements “come in” before lower back and hip movements.

Oral movements, being located at the uppermost part of the spine, are some of the earliest to develop in infancy. In fact, we expect full-term healthy babies to be ready to suck shortly after birth. Because oral movements are some of the first ones to be organized, oral-motor therapy often is the beginning point of an entire NDT or sensorimotor treatment program.

- Application to Articulation and Phonological Therapy: Oral-motor therapy can and should be done early in a treatment process for speech delay and disorder.

2. Gross motor control emerges earlier than fine motor control.

Gross motor movements are defined as those movements which require the use of large muscle groups. *Fine motor movements* are defined as those movements which require the use of smaller muscle groups.

In hand development, for example, children first use the whole hand in a gross grasping pattern well-named the gross grasp. From there children learn isolated finger control in grasping and develop a grasp known as the neat pincer. While the hands are immature and still used grossly, children cannot use a neat pincer grasp to pick up a small item. They will rely on their gross grasp even when attempting to pick up something very small.

Oral movements also begin in a gross fashion and develop into refined control over time. For example, a syllable such as /ba/ is produced in infancy with gross movements — the jaw moves up and down in large movement patterns and the lips move hardly at all. Over time, the jaw begins to move in smaller graded movement patterns and the lips become more active. The final result of oral-motor maturation is the production of /ba/ with limited jaw activity and relatively greater lip activity. Mature and refined oral control in speech allows the child to develop the rapid and sequential oral movements needed for rapid connected speech.

- Application to Articulation and Phonological Therapy: Articulation and phonological therapy should be constructed to allow for a child's developing oral control. As an example, immature productions of /s/ — those made with gross oral movement — should be expected and allowed, even praised, when stridency is first emerging. This is because the child with immature oral-motor development will attempt to add stridency in his speech before he is able to control it with the refined oral movements necessary to produce /s/ without distortion.

3. Mass movements differentiate one from another over time.

The process of developing independent use of gradually smaller muscle groups is known as the process of *differentiation of movement*. Other terms used to describe this process are *separation* and *dissociation* of movement. When a child develops from a gross grasp to a neat pincer, for example, he is learning to differentiate his individual finger movements from one another and from the hand.

The oral mechanism — being comprised of jaw, lips and tongue — first functions as a single unit. Over time the jaw, the lips and the tongue dissociate their movements one from another and become independent moving parts. Independent use of each part is necessary for production of mature speech.

For example, in mature speech, phoneme /l/ is made by elevating the tongue tip to the palate, while simultaneously lowering the jaw and parting the lips — one part goes up while two other parts go down. Without independent movement in each oral part, phoneme /l/ must be attempted in some other way.

Any first-year speech student knows that young children typically substitute /w/ for /l/, and this common substitution is easy to understand from a movement differentiation perspective. Young children cannot differentially elevate the tongue-tip while depressing the jaw and parting the lips all at the same time. Since the jaw, lips and tongue are poorly differentiated, children make the movements for /l/ more grossly by eliminating independent tongue-tip elevation. Over time, however, children gain this skill and /l/ emerges with an appropriate oral movement pattern.

- Application to Articulation and Phonological Therapy: Programs of articulation and phonological therapy should be designed to include activities and techniques to help foster differentiation of oral movements.

4. All movement is accomplished through an interplay of mobility and stability.

The term *mobility* refers to the moving part of a movement, while the term *stability* refers to its stationary part. These two terms are used relative to one another. The principle means that all movements consist of parts that are more moving and parts that are more stationary. Suzanne Evans Morris has noted that stability allows for advanced and accurate mobility. Stated in the reverse, accurate and advanced mobility is based upon appropriate stability.

For example, to use the hand to write with a utensil, the arm must be stabilized at the shoulder and the hand itself must be stabilized on or near the paper. Without hand, arm and shoulder stability, the hand will not be able to control the fine movements it needs to write legibly.

The term *stabile* does not mean “stationary,” “stiff” or “unmoving.” It refers instead to relative stability. The shoulders and arm stay relatively stabile during hand writing. This means that although the shoulders move a little bit, they are stabile relative to the movements the hand makes.

An interplay of mobility and stability also is needed for advanced oral control and speech. For example, the jaw must be relatively stable so that the tongue can move in efficient movement patterns near and against the palate. If the jaw is unstable — for example if it lateralizes or protrudes too much in speech — then the physical relationship between the tongue and the palate changes, and the tongue will be unable to hit its intended target. Relative stability of the jaw allows for accurate and advanced tongue movements to develop.

- Application to Articulation and Phonological Therapy: Programs of articulation and phonological therapy need to include the concept of mobility and stability. For example, little progress in the production of lingua sounds should be expected until after the jaw comes under relatively greater stability.

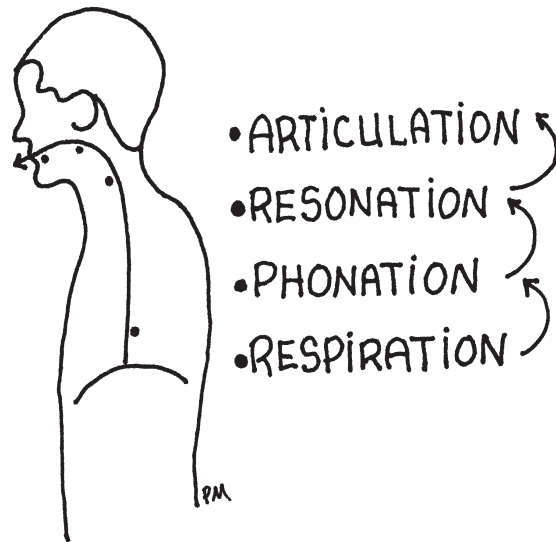
5. Movements develop from proximal to distal.

The terms *proximal* and *distal* are relative ones used to describe distance toward or away from the center of the body. *Proximal* means nearer to the center of the body while *distal* means further away from it. This principle means that movements which are made at points nearer the center of the body tend to be acquired earlier than those made further away.

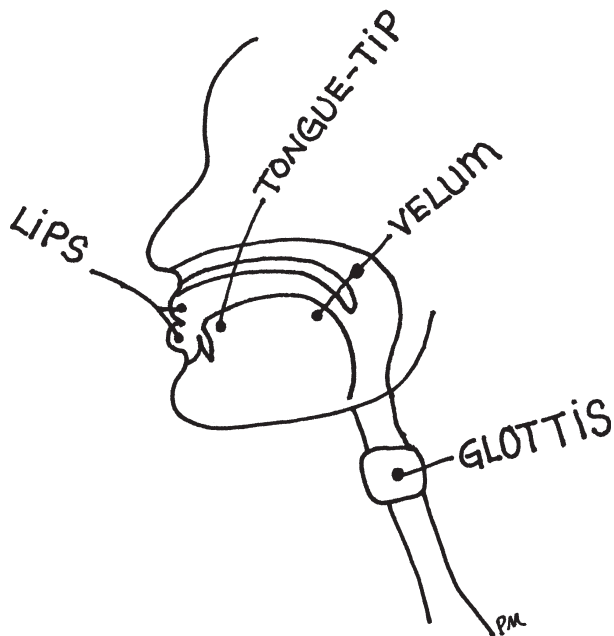
For example, in general, shoulder movements develop before elbow movements, elbow movements develop before wrist movements, and wrist movements develop before finger movements.

In applying this concept to speech, we should consider all four subsystems of speech: respiration, phonation, resonance and articulation. Infant research reveals that vocalizations develop from proximal to distal through these four subsystems as follows:

- Proximal: Between birth and two months of age, babies produce sound. This is movement control at the lungs (respiration) and at the larynx (phonation), the most proximal speech subsystems.
- More Distal: By two-to-three months of age, babies begin to discover how to direct sound and air differentially out the mouth and out the nose. This is movement control at the velum (resonance), a control point more distal to the larynx.
- Most Distal: By four-to-six months of age, babies begin to experiment with sound by making movements with the jaw, lips and tongue. This is movement control in the mouth (articulation), the area most distal of the four subsystems.

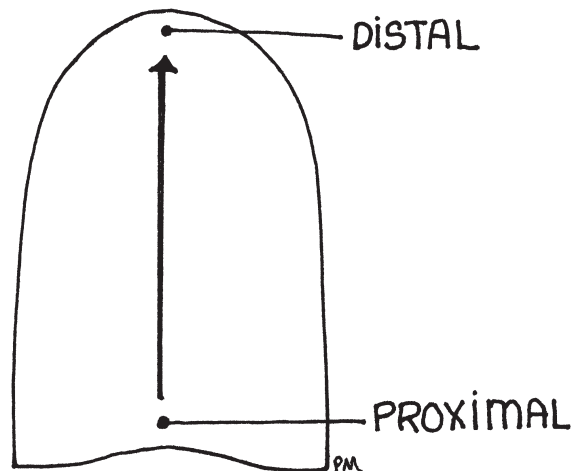


This principle of proximal-to-distal development also helps us see how children begin to learn place of articulation. For example, before true English consonants emerge, children learn to produce raspberries, and they do so at four very distinct places of articulation which are arranged from proximal to distal: (1) at the glottis, (2) at the velum, (3) with the tongue-tip, and (4) with the lips.



Guess which of these sounds are the earliest to emerge? You're right — those that are most proximal, meaning the raspberries produced at the glottis (we call it grunting), and those produced at the velum (we call it a velar fricative). Lingua raspberries and bi-labial raspberries come in a little later.

- Application to Articulation and Phonological Therapy: Articulation and phonological programs should incorporate the principle that oral movements develop from proximal to distal. For example, children with very little oral movement and almost no consonant phonemes might acquire back consonants /k/, /g/, /ng/, /y/ and even /r/ earlier than they are able to acquire anterior phonemes /b/, /m/ and /w/. Programs which routinely and rigidly address anterior consonants phonemes first in therapy need to be adjusted to the client who, because of oral-motor delay or deficit, is more ready to acquire back phonemes.

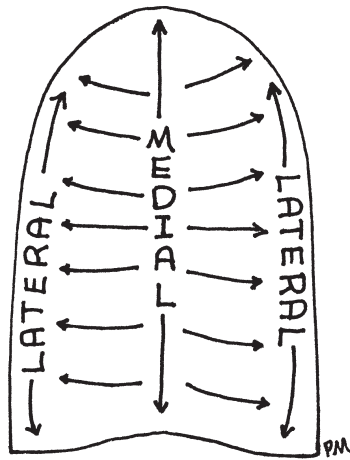


PROXIMAL-TO-DISTAL DEVELOPMENT OF THE TONGUE

6. Movement development progresses from medial plane control, to lateral plane control, and finally to rotational plane control.

The terms *medial*, *lateral* and *rotational* refer to the direction the body moves relative to a fixed position. For example, trunk control is described relative to the spine. Trunk control first is acquired in the medial plane actions of basic extension and flexion. Then, lateral trunk control develops in the form of side-to-side righting. Later, rotational trunk control emerges in which movement around the spine (turning or twisting) is acquired.

Medial, lateral and rotational plane movements also are noted in the development of oral movements, and these are seen most easily in feeding development. For example, the tongue first moves in the medial plane in an anterior-to-posterior movement pattern known as the suckle-swallow. After a few months, the tongue begins to move toward the left and toward the right along the lateral plane when reaching for food presented to one side or the other, when pushing food toward one side or the other, and finally, when transferring food side-to-side.



MEDIAL-TO-LATERAL TONGUE DEVELOPMENT

The ultimate way in which the tongue moves is in rotation in all directions. Rotational tongue movement is a signal that the tongue is fully differentiated from the jaw and has acquired full movement capability. With full movement capability, the tongue is ready for mature articulation skills to emerge.

- Application to Articulation and Phonological Therapy: Programs of articulation and phonological therapy need to include the concept of developing plane of movement. For example, therapy to develop tongue movements for speech needs to address movement in all planes in the order in which they emerge, even though some of the movements themselves are not used in the production of mature speech sounds.

7. Rapid and precise sequential movements are dependent upon the ability to perform discrete movements.

The concept of this principle is fairly obvious. It means that any movement which cannot be performed by itself cannot be used in a sequence of movements. For example, a child cannot throw a ball unless he can lift the arm. The child must learn to lift the arm and to perform other discrete movements before he will be able to put these movements together in sequence to throw a ball.

Quite obviously, the principle applies to oral-motor development. For example, when a child cannot move the lips for production of /b/, he will be unlikely to use that movement in sequence with other consonants and vowels in nonsense syllables, words, phrases, sentences or in conversation.

- Application to Articulation and Phonological Therapy: Traditional articulation therapy always has supported the concept of teaching production of discrete phonemes prior to working on syllables, words, phrases and sentences. This practice should continue in light of what we know about motor development.

8. Movement patterns are based upon economy of movement: the less effort involved, the more likely the movement pattern will be selected.

This principle means that humans tend to use those movement patterns which are easy to perform and which are economical in their use. For example, although we have the ability to spread the fingers widely apart, we almost never do so. Only when we have to — such as when we are polishing the fingernails — will we spread the fingers as widely as we are able. Humans have not developed the habit of frequently using this movement pattern during the course of everyday living events because it takes a little concentration and effort.

The same applies to oral movements. For example, although we have the ability to extend our tongues outside of the mouth to a considerable extent -- as when cleaning the upper lip -- we do not use this movement pattern in speech. It requires too much effort and is not economical. Instead, we maintain close proximity to the *neutral position* inside the mouth from which all lingual speech movements are performed.

- Application to Articulation and Phonological Therapy: Articulation and phonological therapy needs to take this principle into consideration when diagnosing and treating disorder. For example, a child with a large anterior open bite will be unlikely to articulate the upper and lower lips during production of bilabial phonemes /b/, /m/ and /p/. The client may be able to do so on isolated speech tasks, but he will be unlikely to do so in connected speech. Bi-labial articulation during the demands of rapid conversational speech will take too much effort.

Remediation for this client, therefore, must address the oral structure and oral habits which may be perpetuating the structural problem, as well as the process of learning the lip movements necessary to articulate bi-labially. If structural changes through orthodontia or oral surgery is not a possibility now or in the future, then clients often must be taught compensatory patterns, or they must be left to use their deviant pattern. When phonemes are treated without attention to what comes most easily and efficiently for a client's situation, limited success in rapid conversational speech can be expected.

9. Rhythmicity is a basic foundation and a critical component in all movement development.

In normal development, all movements develop in rhythm. As Morris and Klein have written, “We have rhythm generators in all body systems,” and rhythmicity is “perhaps the most basic and encompassing issue of normal development.” Rhythm allows for body systems to work in synch, and this synchronistic coordination of movements brings the efficiency needed for skill acquisition.

For example, when a child can rhythmically coordinate the movements of the head, eyes, mouth and arms, he can begin to explore objects by holding them, looking at them and mouthing them.

In oral-motor development, rhythmicity first allows a child to learn a coordinated sucking-breathing pattern and a coordinated exhalation-phonation pattern. Many months later, rhythmicity allows for the child to produce coordinated consonant and vowel sequences in babbling.

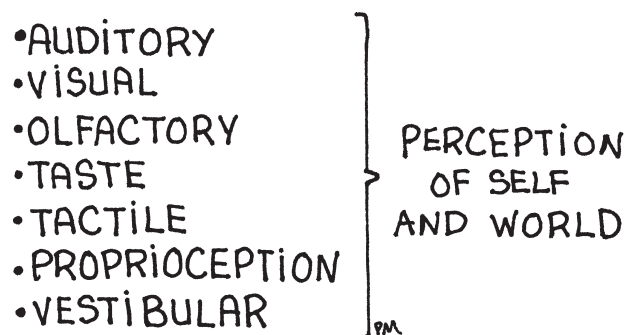
- Application to Articulation and Phonological Therapy: Programs for articulation and phonological development need to include the concept of rhythmicity as children are taught to speak and to articulate.

Sensory Components

In this third section, we describe how sensory perception interrelates with motor learning.

1. Early learning is a sensorimotor experience.

Humans are blessed with seven sensory receptors: auditory, visual, olfactory, taste, tactile, proprioceptive and vestibular. Children use their sensory perceptions about the world to help them perceive themselves and the world. In the sensorimotor stage of intelligence as described by Jean Piaget, infants learn to integrate sensations from all sensory receptors to build concepts of self, movement, objects and the environment.



Sensorimotor learning, which predominates from birth through 18 or 24 months, is a foundational experience in early oral-motor development. Infants and toddlers engage themselves for hours upon hours of sensorimotor experimentation with the mouth in the form of mouthing, eating and vocal play.

Each object which enters the mouth in the mouthing phase is sucked, chewed, licked, smelled, and voiced on. It is banged into the mouth and gagged on, and it is pulled and pushed with the lips and tongue. This systematic mouthing play teaches infants about objects — their size, shape, temperature and texture — and it teaches them about their own mouths — its size, shape and movement capabilities.

Infants also spend an enormous amount of time “playing with” vocalizations and speech sounds during this period. This is sensorimotor experimentation with sound which functions as a foundation for the oral movement discoveries used in speech sound acquisition and phonological organization.

- **Application to Articulation and Phonological Therapy:** Programs of articulation and phonological therapy need to include activities to facilitate general sensorimotor and oral-motor learning experiences. In this book, this process is termed oral-exploratory play: it is described in Chapter Three.

2. Problems in the development of sensory perception can interfere with motor development.

A deficit in the function or integration of the seven sensory receptors can result in a child's inability to acquire and organize movements. For example, when a child's tactile system is impaired, especially when it reacts in a hypersensitive manner, he will limit the number and types of substances he will explore with the hands. This, in turn, affects the child's developing hand movements because his explorations with them are inhibited and limited, and his willingness to use them for a variety of activities is depressed.

Oral-motor learning also is affected by problems in sensory perception. For example, when a child is oversensitive to touch stimulation in the mouth, he gags quite easily. As a result, the child will limit the number and variety of object-to-mouth, feeding and vocal play experiences in which he is willing to engage. Without a rich oral sensorimotor, oral-motor learning experience in early childhood, the child has less general knowledge about his oral mechanism and his oral muscle tone may be low due to limited exercise. As a result, this child will be less well prepared for vowel and consonant learning.

- **Application to Articulation and Phonological Therapy:** Programs for articulation and phonological therapy need to include activities to enhance sensory processing so that oral-motor and phoneme learning can take place under optimum conditions.

3. Reflexes form the basis of all voluntary movements.

The term reflex refers to the relationship between stimulus input and motor output. This relationship might be expressed as a formula: Reflex = Stimulus Input + Motor Output. In other words, when sensory stimuli are given to the body, the body moves. This theory proposes that all voluntary movements have a reflex base, and that concept has been somewhat controversial in the motor therapies. For the purpose of this text, we will assume that the principle is true.

$$\text{REFLEX} = \boxed{\text{STIMULUS INPUT}} + \boxed{\text{MOTOR OUTPUT}}$$

PM

Again we turn to the hand to demonstrate this principle in action. Early hand grasping is reflex-bound: stimulation to the palm of the hand (stimulus input) causes the hand to grasp (motor output.) Over time, the reflex activity is diminished and voluntary control over the grasping pattern is acquired.

Following this principle, all oral movements have a reflex base, and this is especially easy to see when we analyze basic tongue movements. For example, elevation of the tongue's lateral margins for production of the sibilants can be traced back to the lateral tongue elevation that occurs when tactile stimulation is applied to the sides of the tongue.

- Application to Articulation and Phonological Therapy: Articulation and phonological treatment programs should include stimulation of oral reflexes when necessary to facilitate oral movement.

4. Complex motor activities are monitored through continuous sensory feedback.

The seven sensory systems not only allow for motor learning, they also allow us to monitor or keep track of our movements as they occur. For example, as we walk, our sensory mechanisms serve to tell us how we are doing. They give us feedback about the position of our legs (proprioception), the uprightness of our bodies (proprioception and vestibular), the relationship of other objects to ourselves (vision and hearing), and so forth. Continuous sensory feedback is the mechanism we use to monitor ourselves completely as we move through space.

The sensory mechanisms also allow us to monitor our speech. The proprioceptive system gives us information about our jaw, lip and tongue positions and movements. The tactile system gives us information about where and how articulation occurs in the mouth and pharyngeal area. The auditory system gives us feedback about the acoustic result of our productions.

- Application to Articulation and Phonological Therapy: Articulation and phonological treatment programs traditionally have been based on auditory training alone. Oral-motor therapy brings methods to help clients become more aware of the feedback their oral proprioceptive and tactile systems are bringing them in regard to phoneme production.

Patterns of Movement Breakdown

In this final section, we specify what happens to movement with interference.

1. When more difficult components are added to the system, the tendency is to resort to more primitive movement patterns.

When stress is added to the human motor system, movement breakdown occurs, and this breakdown is in the direction of simplicity. For example: fine motor patterns revert to gross motor ones, distal movements revert to proximal ones, and rotary movements revert to lateral ones and then to medial ones.

Breakdown to simplicity in oral motor patterns also occurs with stress. For example, when muscle tone is high, the tongue will revert from a mature suck-swallow pattern to an immature suckle-swallow.

Breakdown to simplicity also occurs in oral-motor control for articulation. For example, when a client cannot perform the rapid sequential movements necessary for production of consonant clusters, he tends to reduce or simplify the cluster. As a result, for example, /sp/ in the word “spoon” may change to /p/.

- Application to Articulation and Phonological Therapy: The concept that speech breaks down into simpler movement patterns is a well-accepted one in speech and language therapy.

2. When development is impeded, movement can become delayed and/or disordered.

This principle means that when development is impeded by congenital factors, development of movement can be slowed down (delayed) and/or it will develop along inappropriate paths (disordered). For example, with a neuromuscular disorder like cerebral palsy, (1) movement development is slowed down, and (2) the path of development changes. Thus the child has skills which are both delayed for his age and “abnormal.”

The same occurs in oral-motor development. For example, in the presence of neuromuscular disorder, children develop oral-motor skills slower and they develop “abnormal” oral motor patterns.

- Application to Articulation and Phonological Therapy: Programs of articulation and phonological therapy first need to assess if a child's speech movement patterns are developing along the right path but simply slower to evolve, or whether the child has begun to development abnormal oral movement patterns. When abnormal patterns are noted, these need to be inhibited while more normal movement patterns are facilitated.

3. Abnormal structure usually necessitates an adjustment or compensation in motor function.

Structural differences result in different motor patterns. For example, if one leg is smaller (shorter) than another, the position of the hips changes in relation to the horizontal plane which in turn causes a shift in spine, shoulder and head position. This affects all movements in the body.

In oral-motor development, any structural difference present in the mouth necessitates an adjustment or compensation in movement and posture of the jaw, lips and tongue. For example, the anterior open bite can result in an anterior tongue carriage and a frontal lisp pattern. Oral structural problems can include: fistulas, clefts, short frenums, malocclusion, diastema, missing teeth, velopharyngeal insufficiencies, surgical alterations of jaw, lips, tongue or palate, and so forth.

- Application to Articulation and Phonological Therapy: Because they will interfere with intended progress, oral structural problems cannot be ignored when designing articulation and phonological programs. In the ideal situation, all structural differences will be eliminated either before or during the course of speech therapy. When structural problems cannot be eliminated, compensatory oral movements must be taught.

4. Poor medical status can interfere with motor learning.

This principle is self-explanatory. For example, chronic heart problems can interfere with a child's ability to acquire even the most basic of movements — rolling over, sitting, walking, running and so forth. Presence of medical problems typically slows rate of development due to the medical condition itself and due to general lack of activity.

Medical problems also can interfere with oral-motor learning. For example, severe allergies and other upper respiratory problems can cause difficulty with nasal breathing which, in turn, can cause problems in jaw, lip and tongue posturing and movement.

- Application to Articulation and Phonological Therapy: In the ideal situation, all medical problems will be eliminated either before or during the course of speech therapy. When medical problems cannot be eliminated, compensation for them must be made.

5. Idiosyncratic movement patterns which are unusual, chronic, long-term and habitual can interfere with appropriate motor learning.

Repetitive movement patterns which a child acquires and “over-uses” can inhibit his ability to develop movement patterns. For example, the child who habitually flicks the hands may be slower in the development of hand movements because the hands are otherwise occupied for many hours of the day.

The same applies to oral-motor development: oral habits can interfere with oral-motor learning. For example, chronic thumbsucking can interfere with the development of appropriate tongue movements. Chronic oral habits include: excessive thumb or finger sucking, pacifier sucking, nail biting, lip licking, cheek and tongue chewing, tooth grinding, clothing or hair sucking or chewing, and so forth. Some habits will cause actual oral-structural deviation. The effect an oral habit will have on oral structure and movement depends on three factors: frequency, duration and intensity of the habit.

- Application to Articulation and Phonological Therapy: In the ideal situation, all oral habits will be eliminated before or during the course of speech therapy.

6. Abnormal tone or movement in one part of the body usually necessitates an adjustment or compensation in motor function somewhere else.

This principle means just exactly what it says. For example, low abdominal strength causes an overworking of the lower back muscles. This extra work in the back is compensation for lack of work in the abdomen.

Muscle tone problems also have a direct and powerful effect on oral movement. For example, excessive low tone in the face can cause the client to develop stiffness or tightness in some parts of the face or mouth. When the tongue is tight, for example, it is rendered less mobile, and, with less mobility, it is less able to develop the finer movements it needs to articulate a variety of phonemes correctly.

- Application to Articulation and Phonological Therapy: Treatment of oral-motor problems in articulation and phonological therapy should include techniques to inhibit abnormal tone along with techniques to facilitate improved oral control.

Chapter Two Summary

This second chapter has presented an overview of selected principles of movement development as they relate to whole body movement in general and oral movement in specific. Implications for articulation and phonological therapy have been made.

The general process of oral movement control is one of high organization in development, delay, disorder and facilitation. Thorough knowledge of principles of movement allows one to make intelligent choices about the course of oral-motor treatment and the specifics of daily practice.

Chapter 3

The Tactile and Proprioceptive Systems

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2. The Skin
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7. Stimulus Guidelines for Normalizing Oral-Tactile Sensitivity
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Traditional articulation and phonological therapy programs have been designed around auditory and visual stimulation. Auditory stimulation is provided to increase a client's ability to hear, attend to and discriminate sound. Visual stimulation is provided to teach the client how his mouth should be positioned to say selected sounds. Many clients succeed with auditory and visual stimulation alone, but some do not.

Oral-motor therapy brings tactile and proprioceptive stimulation to traditional articulation and phonological therapy for those clients who cannot and do not progress well with auditory and visual stimulation alone. In this chapter we discuss the tactile and proprioceptive systems and their role in developing oral movement.