

University of Montana

ScholarWorks at University of Montana

Graduate Student Theses, Dissertations, &
Professional Papers

Graduate School

1979

Feeding management program with cerebral palsied children using a Neurodevelopmental Treatment approach.

Karen Lang Clemens
The University of Montana

Follow this and additional works at: <https://scholarworks.umt.edu/etd>

Let us know how access to this document benefits you.

Recommended Citation

Clemens, Karen Lang, "Feeding management program with cerebral palsied children using a Neurodevelopmental Treatment approach." (1979). *Graduate Student Theses, Dissertations, & Professional Papers*. 6189.

<https://scholarworks.umt.edu/etd/6189>

This Thesis is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.

FEEDING MANAGEMENT PROGRAM WITH CEREBRAL PALSIED CHILDREN
USING A NEURODEVELOPMENTAL TREATMENT APPROACH

By

Karen L. Clemens

B.A., University of Montana, 1976


Presented in partial fulfillment of the requirements for
the degree of

Master of Communication Sciences and Disorders

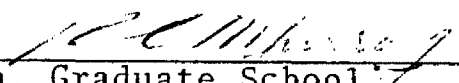
UNIVERSITY OF MONTANA

1979

Approved by:



Chairman, Board of Examiners



Dean, Graduate School

4/25/79

Date

UMI Number: EP36990

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI EP36990

Published by ProQuest LLC (2013). Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against unauthorized copying under Title 17, United States Code



ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation to C. Donald Nelson, Ph.D., and Merry Meek, M.S., whose advice and assistance throughout this project were most helpful. I also would like to express my appreciation to the members of the externship committee, Dr. Parker, Dr. Lyndes, Ms. Reynolds, and Ms. Tucker.

No part of this professional paper may be reproduced in any form without written permission from the author.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
Chapter	
1. INTRODUCTION	1
2. ASSESSMENT	10
3. MANAGEMENT	23
4. DEVELOPMENTAL NUTRITION AND FEEDING PROGRAM AT CHILD DEVELOPMENT AND REHABILITATION CENTER	34
5. SUMMARY	39
6. CONCLUSIONS	45
BIBLIOGRAPHY	50

Chapter 1

INTRODUCTION

In the late 1940s, Karel and Berta Bobath developed an approach to cerebral palsy that was referred to as the Bobath approach. They continuously have reevaluated and modified both the theoretical and practical aspects of this approach, and since 1969 it has been called Neurodevelopmental Treatment (NDT).

Every therapy approach has different underlying philosophies about the nature of cerebral palsy. The Bobaths see cerebral palsy as a "sensorimotor disorder" and point out that it is not one condition but a group of conditions, the result of abnormal brain development or brain damage (Crickmay, 1966). They believe that the inhibitory control normally exerted by the higher centers of the central nervous system fails to develop, and primitive reflex patterns of posture and movement remain long after they should. These include reactions such as the Moro reflex, grasp reflex, and rooting reflex. The retention of these primitive patterns creates a delay in the development of automatic movements such as rolling over, sitting up, sucking, chewing, and swallowing. They also believe that the cerebral palsied child exhibits total patterns of

movement, the result of total extension and flexion. These are highly stereotyped and include patterns such as the symmetrical and asymmetrical tonic neck reflexes, the tonic labyrinthine reflexes, and various associated reactions.

To clearly understand the principles behind Neurodevelopmental Treatment, one first must realize how the normal central nervous system functions in motor learning. The central nervous system operates in patterned responses, and one cannot speak of one muscle without considering the other muscles involved. Even the specific muscles involved in a pattern will depend to some extent on the position of that part in space and the general state of muscle tone in the body. It is a necessary requirement, then, that normal movement patterns exhibit at least two things (Morris, 1970). One is a normal postural reflex mechanism, which consists mainly of the righting and equilibrium reactions that allow the child to combine stability with mobility and move against gravity. The other is adequate postural tone, which does not increase or fluctuate beyond limits.

In the normal central nervous system, automatic movement patterns will develop spontaneously and follow a predictable sequence of development. Patterns such as the grasping reflex, automatic stepping and walking, the parachute reaction, Landeau reaction, head righting reaction, sucking reflex, and others prepare the child for the more volitional aspects of reaching and grasping, standing,

walking, and speech as the cortex of the brain matures. It is speculated that from these repeated patterns the child develops an internal sensory model that serves as the target of comparison as his behavior becomes more volitional and less automatic (Morris, 1970). What is learned automatically at these early stages becomes the child's standard of normalcy.

The cerebral palsied child, however, has repeated a different pattern of movement or has not repeated any pattern at all because of the interference from the primitive reactions or the total patterned reactions. He, therefore, has a different internal motor model to follow.

If these assumptions are accepted as a working model of normal sensorimotor learning and the major motor difficulties of the cerebral palsied child, then the goals of Neurodevelopmental Treatment logically are:

1. The normalization of postural tone through inhibiting abnormal and primitive postural reflexes and
2. the facilitation of normal postural reactions that provide the major contributions to a sensory model of normal movement patterns (Morris, 1970).

The inhibition and facilitation phases are not separate parts of treatment but proceed simultaneously. "These are primarily proximal and involve the neck and spine and the shoulder and pelvic girdle." "Spasticity in the limbs and tension in the throat, lips and tongue can be influenced from these proximal key points." "The therapist, at the

same time, facilitates the desired motor response to occur automatically and without thought from the child." "This is not done by passive manipulation of an arm, leg or tongue." "It is an active movement experience achieved through the inherent automatic reactions which are present in the central nervous system" (Morris, 1970).

It is obvious that the Neurodevelopmental Treatment approach looks at the total child from the most primitive level of motor development on up. Therefore, it has been used by speech pathologists, physical therapists, occupational therapists, and others as an approach to cerebral palsy therapy. The most effective combination is produced when these professionals work as a team rather than separately. They can help the child as a whole. This paper is primarily about the Neurodevelopmental Treatment approach as the speech pathologist would use it. It simply is an overview of the Neurodevelopmental Treatment approach, and it will deal only with one aspect of prespeech therapy: feeding management.

There are no physical structures in the body that are developed solely for speech. Speech long has been thought of as an overlaid function on the structures used in automatic patterns of feeding and respiration. Man is forced to use organs, muscles, and groups of muscles whose basic function is to serve other purposes, namely, to suck, swallow, and chew (Crickmay, 1966). In the Neurodevelopmental

Treatment approach, it is felt that there are automatic patterns forming the foundation for the motor aspects of speech:

1. head control
2. trunk control
3. coordinated respiration and phonation
4. the normal development of feeding patterns and
5. babbling or "automatic speech" (Morris, 1970; Meek, 1978).

These five areas of motor development are extremely important in preparing the child for speech. "The development of head and trunk control with stability of the neck and shoulder girdle provides a stable point of fixation against which the articulators and the respiratory musculature can operate efficiently." "The development of a coordinated pattern of respiration and phonation provides a steady, clear vocalization which can later be combined with oral movements for articulation." "The increased motor precision and oral-perceptual skill which occurs as the child learns to eat foods of differing textures, tastes and consistencies prepares for articulation." "The normal period of babbling allows the child to practice a wide repertoire of possible sound combinations on an automatic level that will later be used for meaningful speech" (Morris, 1971).

If oral-motor skills and motor precision leading to

articulation are developed from feeding skills then, according to the Neurodevelopmental Treatment approach, this is the rationale for the speech pathologist to be involved in feeding management. She also usually is the professional most familiar with the oral-motor area. But how do these oral-motor skills develop from feeding, and how does their development prepare for articulation?

There are two factors contributing to the development of the normal oral musculature that are necessary for speech: physiologic maturation and a wider variety of oral sensory stimulation (Colangelo, et al., 1976). As the normal nervous system matures, less reflexive activity occurs, which is necessary so that the fine controlled movements of speech will occur. The maturation of the musculoskeletal system results in more stability, which contributes to the inhibition of gross, reflexive movements and allows some isolated movement of the parts of the body to occur. For example, as the mandible becomes stabilized, the lips can begin to move independently. When the tongue becomes more stabilized, the movements become more automatic and some independent movements of the tongue tip are noticed. This is the only way that the fine movements necessary for speech have a chance to develop. If the cerebral palsied child is operating in total reflexive patterns of movement, he will not be able to integrate the body parts needed for speech.

Concomitant with this maturation, more sensory stimulation occurs, which will reduce the hypersensitivity of the oral area in a normal infant, thus reducing the reflexive activity also. The introduction of semi-solid foods, spoon feeding, mouthing of toys, hands, and other objects will all help this to occur. This in turn permits growing control. During feeding the growing control becomes very noticeable. With lip closure the child will begin to take food off a spoon. It is interesting to note that at this time the child also will begin to produce the bilabial sounds /p/, /b/, and /m/, which require this lip closure. The infant begins to explore food within his mouth by using the tongue in primitive back and forth, up and down, suck-like or mashing patterns. Admittedly, the feeding movements are relatively slow and primitive compared with articulate speech, which requires faster rates and far greater precision of accuracy. However, these explorations will help develop more and more fine control of the articulators.

Morris and Weber (n.d.) have clearly listed many of the ways that inadequate coordination of the oral mechanism during feeding may interfere with the development of speech skills:

1. Interference with lip closure during sucking, swallowing, chewing, and spoon feeding may also affect the closure necessary for producing bilabials. Vowels and diphthongs may also be affected because the oral cavity size

must be graded by lip positioning.

2. Involuntary movements of the tongue may interfere with the stable tongue placement necessary for vowel and consonant production.

3. Tongue retraction during drinking, chewing, or at rest could cause interference with sounds where the tongue must be in a forward position. These are sounds such as lingua-dentals and lingua-alveolars. There also may be interference with vowel production where the tongue blade must be flattened.

4. Interference with lingua-dental, lingua-alveolar, and lingua-velar sound production may occur with tongue-thrusting in swallowing and sucking.

5. Consonant production requiring lingual protrusion or elevation may be interfered with when there is an inability to protrude or elevate the tongue in retrieving food.

6. A problem lateralizing the tongue for mature chewing may be an indicator of a lack of refined lingual movements necessary for producing combinations of sounds with speed and accuracy.

7. Labio-dental sounds may be interfered with by an inability to draw in the lower lip for food retrieval.

8. The jaw control necessary for all consonant and vowel production may be lacking as indicated by inadequate jaw stability observed with constant mouth-open positions

or with inadequate sustained biting.

9. Inappropriate opening for the intake of food, inability to grade jaw positions as seen in jaw thrusting and lack of a mature sustained bite may interfere with vowel and consonant production. The jaw grading is necessary for moving from one vowel or consonant position to another.

10. Any jaw deviations evidenced in sucking, biting, and chewing may interfere with appropriate positioning and grading of the jaw in sound production.

11. A persistent suckling pattern, which inhibits mature sucking, biting, and chewing, may indicate a delayed development in the skilled oral movements necessary for the production and combination of a variety of sounds.

Any of the above interferences may occur in cerebral palsy. Therefore for the speech pathologist trained in the Neurodevelopmental Treatment approach, it is critical that she use feeding management as a foundation for the motor prerequisites of speech.

Chapter 2

ASSESSMENT

Although a great deal of research is needed, it may be possible to actively reduce many of the communication deficits seen in older children that are due to motor incoordination. By starting early management to improve tongue, lip, and jaw movements when feeding, the finer motor movements to be used in speech production may be improved.

There is a preliminary step to assessment, and that is recognizing that a problem does exist and then being sure that the parents also are aware of this. Schmidt (1974) has developed a list of patterns that indicate a feeding assessment should be made:

1. Choking and coughing more than one or twice during each meal
2. Inability to keep most food and liquid inside the mouth and swallow it
3. Tendency to bite down hard on the spoon
4. Intolerance of solid foods beyond the developmental age of 6-9 months (inability to chew, choking, tactile sensitivity)
5. Abnormal sitting posture (i.e., head tilted back or to the side, body tilted laterally, etc.)
6. High muscle tone
7. Great effort expended by parent or child resulting in unpleasant mealtimes
8. Persistent tongue thrust beyond the age of 6 months (in and out movement of the tongue; usually goes along with inability to chew, choking and other findings).

Many children with cerebral palsy will have several of the above-mentioned problems or possibly others interfering with food intake.

When it becomes apparent that there really is a problem, then a thorough sensorimotor evaluation is in order. This entails a systematic assessment of the child's abilities and disabilities. There are many tools based on the Neurodevelopmental Treatment approach that are available. For example, Schmidt's (1974) "Eating Assessment Tool (EAT)" is a questionnaire that uses a rating scale with higher scores being the ultimate goal. Her form assesses positioning and gross motor skills, oral skills, eye-hand coordination, feeding behavior and environment, and the caretaker's and evaluator's perception of problems. Schmidt indicates that one of the shortcomings of the tool may be the lack of grading for differences in quality of motor performances. To help correct this she has included a section for written descriptions of the individual's motor abilities. Because so many areas are incorporated in this one form, it can be used quite easily by many disciplines on a feeding team. It is easy and quick to administer and does not require a large amount of training to use. It also was designed to be used before, during, and after therapy as an indicator of progress.

Mueller (1967) has developed a sensory motor speech evaluation form for assessment. Her form has not been

published because she believes that anyone providing assessment with this tool should be specifically trained in its use. A one- to two-week course is provided for speech pathologists to learn to use it; with this training, the evaluation form is a very appropriate tool (Meek, 1978). Mueller has not used a numerical rating scale because she feels that it is easier and more definitive to describe the child's behaviors. The ten steps in her sensory motor speech evaluation follow:

1. Observation of facial expression at rest and in motion
2. Testing of the oral reflexes to help in detecting motor dysfunctioning of structures used in feeding:
 - a. Rooting
 - b. Sucking-swallowing reflex
 - c. Bite reflex
 - d. Gag reflex
3. Abnormalities in feeding behavior
4. The response around and in the mouth to stimulation from the therapist's finger
5. Malocclusions and abnormalities of the palate
6. Observation of the jaws at rest and in motion
7. Observation of the lips at rest and in motion
8. Observation of the tongue at rest and in motion
9. Observation of breathing at rest and under stimulation
10. Pitch, range, volume, fluency and intonation of the voice (Mueller, 1967).

A summary evaluation of the therapist's conclusions based on the ten steps described above is to be included at the end of this paper.

Morris (n.d.) also has developed an assessment tool that has not yet been published. Her form is called "Sensory-Motor Evaluation of the Speech Mechanism: A Rating Scale for the Measurement of Pre-Speech Behaviors from

Birth Through Three Years." It also requires a training course to become thoroughly familiar with it and use it properly. The scale is a weighted point system that gives fewer points for sensori-motor behaviors considered abnormal or pathological, an increasing number of points for behaviors that would be thought of as part of an early infant repertoire, and the most points for behaviors characteristic of normal development. These scores are then charted and enable the speech pathologist to quantify the gains in pre-speech areas that occur. A charting system also allows for a variety of research to occur. Longitudinal data collection in an active feeding program, reliability studies, and easily studied graphs of progress are only a few of the areas charting might supplement. The specific areas assessed by Morris' form are:

1. Feeding behavior
2. Sucking
3. Swallowing
4. Biting and chewing
5. Tactile sensitivity
6. Imitative control
7. Respiration
8. Phonation
9. Articulation.

There are many other assessment tools available; probably one of the best resources for these is the

monograph titled Feeding the Handicapped Child: Proceedings of the Conference for University Affiliated Programs (McKibbin and Cloud, 1976). Not all of the tools in this monograph are based on a Neurodevelopmental Treatment approach.

Many of the Neurodevelopmental Treatment evaluation forms go beyond just feeding behaviors and look at behaviors such as imitation, phonation, and articulation. This is logical because of the basic philosophy that feeding patterns provide the foundation for motor speech production. But if one looks simply at feeding, the Neurodevelopmental Treatment forms are all basically assessing the same things. All the tools are based on a normal child's development of feeding and therefore require a thorough knowledge of that area. The assessor must know what is normal and what is pathological behavior.

One of the most important areas that assessment deals with is positioning. The person assessing the child must look at the typical positions in which the child is fed. If this seems to be increasing the child's spasticity or involuntary movements, which also will be observed in the face, mouth, and throat, then that person needs to experiment and find a position where the most optimal functioning and normal muscle tone are obtained. Often by changing the child's position and physically handling him differently, he will become less stiff and tense throughout the body.

The muscles used in feeding will be more normal and will function better when the entire body is taken into consideration.

The assessor must be familiar with certain stereotyped patterns that cerebral palsied children exhibit during feeding and what positions are likely to inhibit these. One stereotyped pattern that often occurs is an extensor pattern where the child will push his head back when eating; as this happens, the jaw often will open widely and the tongue may push the food out more frequently. These movements will increase the child's overall body stiffness as well as stiffness in the mouth and throat. The child will have much more difficulty getting his lips together for efficient sucking, spoon feeding, swallowing, or chewing. Tightness in the throat also will make swallowing slow or very difficult. These extensor patterns will interfere with the coordination of breathing and eating. A more normal position for eating and swallowing is to have the head slightly forward with neck elongation and the chin tucked.

Other cerebral palsied children may tend to pull forward with tight arms and shoulders, especially when they are touched around the mouth. Not only is the whole body tighter, but it is very difficult for the child to open his mouth if the head is pulled down by tension. The tightness in the shoulders and chest will cause difficulties in

coordinating breathing with eating as well.

The asymmetrical tonic neck reflex also may occur during feeding, and as the head is turned to the side, there will naturally be an increase in tightness in the mouth and jaw. Others may not be able to stabilize their heads, necks, and trunks because of involuntary movements. This instability will lead to the continuation of abnormal feeding patterns and will only complicate the process.

Many of the assessment tools also look at oral reflexes. In the normal course of development, these oral patterns are present early as fairly strong reflexes and gradually they become weaker. In the cerebral palsied child, however, they often remain long after they should; this tells the assessor much about the child's level of development as well as what therapy techniques to use. Usually, the main ones assessed are the rooting, sucking-swallowing, bite, and gag reflexes. A rooting reflex is present in the normal baby from birth to about three months of age. The cerebral palsied child may show remnants of this reflex for a much longer time, or some children may never have a rooting reflex. The sucking-swallowing reflex appears normally within the first or second day and remains until about three to five months. The bite reflex normally is present from birth on, gradually becoming weaker and disappearing at about three to five months. Cerebral palsied children often continue to have a bite reflex for a

number of years or for their entire lives. Normally, the gag reflex is present from birth on but becomes weaker after chewing begins and the child is introduced to different food textures. Absence of this reflex or elicitation of it by touch to the front half of the tongue, hard palate, or lips is abnormal at any time of life (Mueller, 1967).

Hypersensitivity in and around the mouth often is exhibited in cerebral palsied children. A normal child may dislike this part of the assessment, but the oral muscle tone will remain relaxed on palpation. The cerebral palsied child, however, often reacts in a total hyperextension pattern or even with a startled response. Frequently, he will become physically stiff, and there will be an increase in tightness about the mouth, throat, and face. This piece of information is very important because over-stimulation during feeding will then have to be guarded against.

Observation of respiration also is important in an assessment. In the normal child, respiration and sucking alternate generally in a ratio of either 1:1 or 1:2, i.e., respiration:sucking (Morris and Weber, n.d.). Respiratory movements usually follow every swallowing movement. Cerebral palsied children, however, frequently are incapable of this rhythmic coordination between sucking, swallowing, and breathing.

Assessment tools also usually look at the actual feeding behaviors of the child. The person assessing must

be aware of how feeding progresses in normal development and what may occur in the cerebral palsied child. Developmentally, the first feeding ability to occur will be sucking and swallowing from a nipple. As mentioned before, a normal newborn will take food in with this reflex during the first few months. The tongue makes a seal with the anterior portion of the palate and protrudes forward and backward, causing liquid to flow from the nipple. The baby first will suck and then swallow each time there is liquid in his mouth. As he develops, he will modify this pattern until he is able to suck several times before swallowing. Some babies with cerebral palsy may not have a sucking reflex at all. Others may have difficulty even sealing their lips around a nipple to prevent most of the liquid escaping from the corners of the mouth. Those with involuntary movements will not be able to coordinate their sucking; consequently, too much liquid often flows into the mouth and causes choking. This usually is described as a poor grading response. Chewing rather than a sucking movement also frequently is seen in cerebral palsied babies.

By six months of age, the normal child usually is ready to begin taking a semi-solid food from a spoon. He will begin to use his upper lip to scoop the food off the spoon and transfer it for swallowing. His swallow will begin to be more adult-like in that the tongue will not protrude as far forward and will be much more curved posteriorly to propel the bolus of food down the throat. The

person assessing the cerebral palsied child should look at whether the jaw thrusts or opens too widely (poor grading) as the spoon is presented. Normal children at this developmental age are amazingly adept at grading their jaw movements only as much as is necessary to accommodate different size bites of food. A strong bite reflex that should have been inhibited by now may be particularly evident as the cerebral palsied child often will bite down strongly on the spoon.

At six to seven months developmentally, the child will approximate chewing with an action called munching. At this stage there will be less dribbling of food as the child eats. The tongue will be predominantly flat with solid foods, and there will be little or no lateralization to it. No rotatory movements of the jaw will be seen yet at this stage. Gagging also will have decreased because this reflex has continued to decrease with the introduction of various food textures and with the beginning munching movements. The cerebral palsied child, however, may not be able to produce these munching movements, and the tongue may still be making forward movements or it may be retracted or "glued" to the roof of the mouth. He may still choke and gag frequently because the food is only partially mashed between the tongue and palate, not chewed, and the fibers are not broken down.

The normal child usually begins to show an interest

in the cup he sees his parents drinking from at about seven to eight months of age. Most parents then allow their children to take a few sips from their cup while they hold it. At first, there will be incoordination; not until the child is about eighteen to twenty-four months of age will he be able to drink from a cup without help. However, during this time he will begin to have better stabilized jaw control for sucking liquids into the mouth. At about one year of age, he will be able to drink from a cup if it is held. He will have a good lip seal and only occasionally will lose liquids from the sides of the cup. The more mature swallow he has been developing will be used now during cup drinking. The cerebral palsied child, however, may not have a good lip seal, and his tongue may protrude over or under the rim of the cup. He probably will still try to use a sucking pattern, resulting in loss of liquid at the sides of the mouth. He also may initiate sucking with an opening and closing motion of the mouth and then change to the sucking pattern.

Finally, the assessment should look at the child's ability to bite and chew. Between about nine to twelve months, the child will be able to handle more solid foods such as well-cooked pieces of diced vegetable or toast. The normal child now will be able to bite in a controlled and sustained fashion. Chewing will primarily be a vertical up and down pattern, but rotatory movements will begin

to be seen intermittently. The tongue will not use an extension-retraction movement because it now is using a gross rolling movement in moving food from one side to the other. Occasionally, the tongue tip will be seen transferring or retrieving food from one or both sides of the mouth. The child will begin to remove food from either the upper or lower lip by drawing the lip inward or using his upper incisors to clean food from the lower lip (Morris, 1977).

At twelve to twenty-four months, there frequently will be rotatory movements of the jaw during chewing. The tongue will transfer food with precise movement to both sides of the mouth now. Food that is placed between the teeth on either side of the mouth will be transferred to the other side. If food is placed in the center of the tongue, the child now will be able to transfer it to either the right or left side. Very little food or saliva will escape from the mouth now because he is able to chew with his lips closed. Anything that does escape will be cleaned from the lips with mature lip-cleaning motions as described above (Morris, 1977).

Basically, then, these are the usual feeding behaviors that will be evaluated in a Neurodevelopmental Treatment assessment. As in most approaches to communication disorders, the assessment and management portions are inseparable. This also is true in this approach. As the

assessment is being made, the speech pathologist is experimenting with management techniques she feels will be beneficial to the child. However, in a written description of an approach, it is easier to separate the assessment section from the management section. This is what has been done in this paper, and the management techniques will be described in the next section. It is important to remember, however, that the two are not separate in actual practice.

Chapter 3

MANAGEMENT

It must be noted that what is described in this chapter simply is an overview of what management entails. Specific techniques are described, but they will not be appropriate for all children with cerebral palsy. It should also be noted that speech pathologists trained in Neurodevelopmental Treatment do not believe that these techniques should be used by the untrained. It is their belief that without the basic underlying training these techniques probably will be unproductive in management and actually could be harmful to the child. The techniques described here are compiled from Mueller's chapter in Handling the Young Cerebral Palsied Child at Home (Finnie, 1975) and Morris' (1977) Program Guidelines for Children with Feeding Problems. Both are good sources for more detailed information.

The Bobaths believe there are many reasons why children with cerebral palsy may benefit more from early treatment started by the age of nine months (B. Bobath, 1967):

1. Plasticity of the infantile brain--the first eighteen months of life is the stage of the highest

potential for learning and for adjustment to cerebral damage.

2. Importance of sensorimotor learning--the learning of movements is entirely dependent on sensory experiences that not only initiate but guide motor output. The cerebral palsied child will need therapy to develop more normal sensorimotor patterns.

3. The child's mental development--secondary mental retardation and disturbances of perception may be prevented by helping the child to control and adapt his motor movements in a more normal way.

4. Abnormal postural reflex activity--abnormal postural reflex activity and spasticity or athetosis usually are not very strong in infants; therefore, changes of abnormal postural patterns with reduction of hypertonus can be obtained more easily than later on.

5. Time factor--very early treatment gives quicker and better results because the child is not as yet very abnormal. The mother, if instructed properly, also can become an active member in the treatment program, with the result that the infant receives more treatment.

The sooner management is begun, the greater the chances, then, of improvement. Usually, the first area that is treated is positioning. If the child does not have good positioning, the automatic patterns forming the foundation for the motor aspects of speech will be unable to develop:

1. head control
2. trunk control
3. coordinated respiration and phonation
4. the normal development of feeding patterns
5. babbling or "automatic" speech (Morris, 1970; Meek, 1978).

The child will not be able to function optimally because he will become more spastic or have increased involuntary movements. Looking only at the feeding aspect, the cerebral palsied child must be helped to gain the ability to move his head, jaw, lips, and tongue independently from his body while still maintaining good sitting balance. Handling the Cerebral Palsied Child at Home (Finnie, 1975) is an excellent source for different positions to use when feeding a child. One way Finnie describes is to have the child lie supine on the mother's lap facing her. This allows the mother to apply certain feeding techniques easily. If the child has some sitting balance, the child may sit across the mother's lap with his knees bent at right angles and held slightly apart. The support the mother provides at his lower back or shoulders gives him added stability. As soon as the child has some head and trunk control, he should be fed in a chair. His hips, knees, and elbows should be at right angle positions with the knees slightly apart. The mother can again provide more head, neck, and trunk stability, if needed, by wrapping her arm behind the

child's back.

There are many techniques Neurodevelopmental Treatment speech pathologists use when feeding cerebral palsied children. These include normalizing facial tone, use of jaw control, vibration techniques to improve breath support, and others. All of these require specific "hands on" training and cannot be learned simply by reading a written description of them.

In addition, these principles should be followed. In all of the above positions, the food should be at the side of the mother and not behind or in front of the baby. If it is behind him or in front of him, it could cause him to stretch to see each spoonful, and this would only add to his spasticity or involuntary movements. One should also be at a lower level than the child when he is fed in a chair, otherwise he will tend to look up and push his head back.

Many distortions in the coordination of the respiratory pattern and feeding occur as the result of abnormal reflex activity and abnormal postural tone. The hypertonic child frequently shows a stiff or rigid chest and spine, which affects the development of mature breathing patterns. The hypotonic child lacks the fixation against which the breathing muscles can work effectively. The primary focus in the treatment of this, then, is the normalization of postural tone, which can be facilitated by the

positioning techniques described above. Morris and Weber (n.d.) described why positioning is important here:

1. The flexibility of the spine is very important in getting good breathing patterns. The increase in thoracic cavity size on inhalation can only occur if the lower six ribs can "swing out" as the diaphragm descends, thus increasing the longitudinal as well as the anterior-posterior size of the cavity. This can only occur if the abdominal muscles relax. The child whose spine is fixed and rigid is prevented from attaining these free, relaxed movements. Thus, any positioning to obtain more normal postural tone in the abdominal muscles and a loosening or mobility of the spine will assist in the coordination of sucking, swallowing, and breathing.

2. Better head control and stabilization of the trunk will help produce better basic breathing patterns. The head and shoulder girdle provide the needed fixation and stability for the respiratory musculature to work efficiently.

Direct control of the oral area is another aspect of treatment that is extremely important. This aspect is called jaw control. It also is one area that should not be used by anyone not specifically trained in its use. Without it, the child may thrust his jaw open too widely, indicating a lack of smooth jaw gradation; he may be unable to seal his lips around a nipple or cup; or he may lack the

control for the finer movements needed in chewing. With jaw control, there may be improvement with the child's suck-swallow reflex, his ability to eat from a spoon or drink from a bottle or cup.

As mentioned in the assessment chapter, cerebral palsied children often evidence tactile hypersensitivity around and in the mouth. This always is followed by feeding problems as the child reacts to each stimulus of the spoon, cup, food, or liquid in the mouth. Gagging, choking, or total extensor thrust are frequent consequences. Jaw control and positioning will help inhibit these reactions. The introduction of different textures of food also will help. Many mothers have a tendency to scrape off food that has dribbled down the child's chin with the spoon. Keeping the child's face as clean as possible seems to be a natural thing for her to do, and it is a difficult habit to break. But it must be broken when feeding a cerebral palsied child who is hypersensitive. Only when it is really necessary should she clean the face. This is done by blotting the mouth with a cloth using firm, slow pressure. One or two blots is all it should take to clean the child's face each time.

If the speech pathologist during assessment has found the baby to have an abnormal suck-swallow reflex, there are several things she can try during the management phase. Body, head, and jaw control will usually be of immediate help. If the child has difficulty in sucking, three or four

small holes may be made in the nipple with a fine, heated needle. As the child improves his sucking response, these nipples can be replaced with smaller-holed ones, so he will learn to suck more strongly. The liquid also can be slightly thickened so the flow is not so fast that choking occurs (Finnie, 1975).

It also should be remembered that those trained in the Neurodevelopmental Treatment approach, for example Mueller, believe that if a child is so severely handicapped that there is no suck-swallow reflex at all one should skip this stage and move to spoon feeding or cup drinking (Finnie, 1975).

For the child who is unable to close his lips or use them to help remove food from a spoon, there are techniques to develop better control of the lips. Jaw control will prevent the mouth from opening too widely when food is presented, and it will allow closure of the mouth during eating so the child is more able to use his lips efficiently. With jaw control, the child's jaw is kept lightly closed until the spoon is brought to the mouth at midline. The mouth is then allowed to open halfway while the spoon is placed on top of the anterior half of the tongue. The spoon is pressed down on the tongue fairly firmly and held for a few seconds until the lips begin to close to take the food off the spoon. The pressure on the tongue helps prevent the tongue from pushing forward and helps the child

gain better action of the upper lip in removing food from the spoon. The spoon should be withdrawn straight out without scraping the food off the spoon with the upper incisors, since the upper lip must learn to do this. Immediately after the spoon has been withdrawn, the jaw should be closed until swallowing has occurred so the tongue does not push the food out.

As mentioned, food is always presented at the midline because any other presentation may cause hyperextension or involuntary movements of the head and jaw and often the entire body. A small amount of food placed on the anterior portion of the spoon is better than a large portion. The large portion may cause the child difficulties in processing the food. There also are several varieties of spoons that may be used in feeding. Often, a shallow-bowled one helps the child use his upper lip more for cleaning the food off. Latex-covered spoons are very good for children who have a strong bite reflex because it protects the child's teeth and palate as he bites down.

When cup drinking is being taught to a child with cerebral palsy, control of the whole body, head, and jaw is still important. The jaw control often is necessary for mouth closure. Without the mouth closure, the child will never be able to use his lips and swallow without gulping air. If the jaw is kept closed, the child will tend to use his upper lip more for sealing. A plastic beaker with a

cut-out opening on one side for his nose lets one see and control what is happening at the mouth. This also avoids the necessity of bending the child's head backwards to get the liquid in the bottom, which may cause choking. The cup should be placed on the lower lip just in front of the teeth to encourage lower jaw stability. Placing the cup between the teeth often results in the stimulation of a bite reflex. The cup should not be removed after each swallow as this may cause overstimulation with loss of head and jaw control resulting.

Beginning cup drinking with a thicker liquid such as yogurt, strained fruit thinned with juice or pudding may prove more successful. The thicker liquid will flow more slowly and give the child more time to swallow. One wants to prevent any choking or a bad initial experience with the cup. Gradually, the thickened liquid can be thinned until it is of normal consistency.

By the time a child is ready to learn to chew, he should have been introduced to thicker and semi-solid foods. It is usually best before the meal to begin by placing strips of food such as rare cooked meat or dried fruit on the side of the mouth between the biting surface of the teeth in the premolar or molar area. These are safe foods because the child cannot bite them off and get them caught in the back of his throat. While holding the end of these strips, jaw control can be applied to help the child

close his mouth firmly and facilitate chewing. He not only will be stimulated to chew but will be getting nourishing juices from the food and practice swallowing.

As the child learns chewing skills, the difficulty of the food eaten at mealtimes should be increased. Pieces of softer meats such as chicken or fish can be given first, with a gradual increase in size. Later, very chewy meats such as beef or pork can be introduced. Mueller (Finnie, 1975) does not recommend moving the child's jaw during jaw control in up and down movements to resemble the rotatory movements of chewing. She believes this would only reinforce abnormal patterns. Morris (1977) does recommend using one's hand to assist the child in rotatory movements of the jaw or having him watch you while you imitate exaggerated chewing movements.

As the child increases in his ability to chew, pieces of pretzel or toasted bread can be placed between the teeth, and with jaw control the food can be pulled slightly so that biting is stimulated. Once the child has managed to bite, the jaws must stay closed by continuous firm pressure during jaw control. These crisper foods also will be effective in stimulating chewing.

It must be mentioned that only certain feeding techniques have been described in this chapter. There are many others that Neurodevelopmental Treatment speech pathologists are trained to use. The above techniques, however, do give

an overview of some of the basic feeding management procedures.

Chapter 4

DEVELOPMENTAL NUTRITION AND FEEDING PROGRAM AT CHILD DEVELOPMENT AND REHABILITATION CENTER

Because Neurodevelopmental Treatment is an approach to the whole child, a feeding team will consist of other disciplines besides speech pathology. At The Crippled Children's Division, Child Development and Rehabilitation Center (CDRD), a division of the University of Oregon Health Science Center at Portland, Oregon, the Developmental Nutrition and Feeding Program consists of a nutritionist, occupational therapist, and speech pathologist.

At CDRC, feeding evaluations are held once a week for children between the ages of zero and twenty-one years of age. The purpose of the evaluations is to improve oral-motor coordination, self-feeding skills, and to provide adequate nutrition for growth. The children evaluated at CDRC evidence one of the following problems:

1. Difficulty developing sucking, swallowing and chewing skills necessary for eating due to physical, behavioral or developmental problems.
2. A lack of development of independent self-feeding skills.
3. Inadequate nutritional intake and a failure to thrive [Wright, et al., 1978].

The children must have been evaluated in a diagnostic clinic at CDRC or have been seen by a CDRC physician. This

ensures that a physician has examined the child to rule out things such as physical structural problems or allergy problems. This is a very necessary requirement, for it also safeguards the feeding team.

The mother is instructed to bring the typical kind of snack that the child is eating at that time and any special kinds of equipment he needs. Then the mother feeds the child as she would at home during the evaluation. Techniques to modify problem areas are tried during the evaluation. Most assessments last forty-five minutes to one hour. At the end of the evaluation, recommendations are shared with the parents. A reevaluation date usually is set for about three months, depending on the progress or the concerns expressed.

It has already been described what the speech pathologist on a feeding team is assessing. The other members of the team have a Neurodevelopmental Treatment basis for their evaluations also. The nutritionist at CDRC sends a three-day food diary to the parents before their appointment. The parents are instructed to complete this by listing the child's food intake for three days, including one day on the weekend in case the family's eating habits change then. If this is returned before the appointment, the nutritionist has time to analyze the child's diet by computer. This will tell her if the child is receiving at least 75 percent or more of the recommended dietary allowances of different

nutrients. If the diary is not received before the appointment, she must informally assess whether the child is receiving a nutritionally adequate diet. She must take into account the child's height, weight, and developmental age during this assessment.

Probably one of the most important problems the nutritionist deals with is children who are failing to thrive. The mother simply may not be knowledgeable as to how much liquid and food a child requires, she may be unable to keep the food in the child, or there may be a variety of reasons. Other mothers have so many problems that they feed their child all day long in hopes that the child gets enough. The nutritionist must provide the mother with information as to exactly how much food and liquid her child requires.

The nutritionist encounters a variety of problems when making recommendations. Eating is influenced by many things, for example, cultural life styles, food fads, and dietary restrictions. She must often adapt her suggestions to fit these individual life styles.

During the feeding evaluation, the members of the team are listening carefully to what other team members are recommending. If the speech pathologist, for example, has recommended the introduction of more texture in the diet to stimulate oral movement, the nutritionist will be able to offer specific suggestions of foods to use (Cunningham, 1978).

The occupational therapist at CDRC looks at basically five things during a feeding evaluation (Wright, 1978):

1. The total body reaction during feeding: She is assessing the child's overall muscle tone, reflexes that occur, seizures that may be produced, postures, and total movement.

2. Adaptive and special equipment: While she is watching the child's overall body reactions, she is thinking of the changes in positioning that may help the child inhibit those that are interfering. It is her job to obtain the adaptive or special equipment that the child will need to make feeding easier.

3. Oral-motor movements: She is assessing this area but not as thoroughly as the speech pathologist on the team.

4. Self-feeding readiness: Many of the children seen by the feeding team at CDRC are very young; therefore, she will look at their "pre-self-feeding readiness." This involves finding out whether the child does any kind of "food play," hand-to-mouth activity in play, or reaching for objects in his environment. The occupational therapist can then give the mother suggestions to get the child ready for self-feeding.

The first thing to be assessed in self-feeding is whether the child can handle self-feeding physically. The

therapist is cautious in beginning this complicated kind of coordinated activity and takes into account the overall child. If this is begun too soon, one can destroy many of the gains already made in other areas. The occupational therapist must be very careful in evaluating the child's positioning at this point in order that the child receive as much support as necessary. She may need to provide him with special or adaptive equipment if needed.

5. Mother's status: The occupational therapist finally evaluates the mother's ability and willingness to incorporate the recommendations made into her daily feeding routine. The mother is one of the most valuable persons in a feeding program if she is willing and able to follow through with recommendations. She is the one who will provide the major part of the therapy from day to day. Some mothers are able to follow through with many suggestions at each evaluation. Others must go much more slowly and will only be able to adapt to one suggestion at a time. This is important information for all team members to know.

The above is a short summary of the Developmental Nutrition and Feeding Program at Child Development and Rehabilitation Center. The procedures used by members of this program are working very efficiently for them. There are many other ways to run a feeding program, however, and one of the best sources for more information is Feeding the Handicapped Child: Proceedings of the Conference for University Affiliated Programs (McKibbin and Cloud, 1976).

Chapter 5

SUMMARY

With increasing sophistication in identifying those children with cerebral palsy in infancy and early childhood, there is a challenge presented to the speech pathologist to provide early management programs. The prevention of secondary retardation due to lack of experience related to sensory-motor dysfunction is of prime importance. Many speech pathologists feel that intervention for motor difficulties is begun "when the child fails to develop speech" (Morris, 1971). In the Neurodevelopmental Treatment approach, poor head and trunk control, feeding difficulties, abnormal patterns of respiration and phonation, and failure to develop sound sequence patterns in babbling are all felt to be predictors of later motor-speech difficulties. Delays or abnormalities in these prerequisites for speech can be identified early in a large number of cerebral palsied children (Morris, 1971). The speech pathologist who is trained in and uses Neurodevelopmental Treatment believes she has techniques to deal with the development of these pre-speech skills. She does not wait until speech develops before initiating management.

Any or all of the above motor prerequisites may be

interfered with simply because of the characteristics of cerebral palsy. Morris and Weber (n.d.) list these characteristics as abnormal postural tone, abnormal oral and facial sensitivity, abnormal oral reflexes, and an inability to voluntarily control the oral mechanism. Looking again only at feeding difficulties, some of the following problems may occur (Morris and Weber, n.d.):

1. Abnormal postural tone

- a. Hypertonicity may cause:

- 1) Interference with normal respiration; consequently, vocalizations may be short in duration and tense in quality.
 - 2) An inability of the tongue to explore the oral cavity and tongue retraction or protrusion that interferes with feeding. The lips may be consistently retracted, precluding the closure necessary for sucking, swallowing, chewing, and the production of bilabial sounds. The jaw may thrust or be unable to maintain closure.
 - 3) An inability of the oral structures to move independently.

- b. Hypotonicity may cause:

- 1) An inability to maintain head and trunk control, which may affect the ability to

initiate or sustain sucking, swallowing, biting, chewing, or vocalizing.

- 2) The lack of head stability in the laryngeal and thoracic areas may impair normal voice patterns and produce inadequate respiration for speech production.

c. Fluctuating muscle tone and/or intermittent spasms may cause:

- 1) Irregular breathing patterns, which may interfere with the coordination of swallowing and breathing as well as disrupt the coordination of phonation and respiration.
- 2) An inability to grade movements, which may interfere with graduated jaw opening for the acceptance of food and for various vowel productions.
- 3) Fluctuations of muscle tone in the oral and facial area, which may interfere with the smooth coordination of sucking, swallowing, biting, and chewing. Jaw deviations or tongue thrusting may result, and there may be an inability to maintain lip approximation for sucking, swallowing, chewing, or the production of labial sounds.

2. Oral and facial hypersensitivity may cause:
 - a. Interference with all aspects of feeding and sound production because of the increase in abnormal postural tone when the oral or facial areas are touched.
 - b. A bite reflex, abnormal gag response, or facial grimacing, which will limit continuous sucking or the manipulation of food for chewing.
 - c. Inadequate tactile-proprioceptive feedback in the oral mechanism interfering with the development of the normal oral experiences of feeding and sound production.
3. Abnormal oral reflexes may cause:
 - a. Persistence of a bite reflex, which may inhibit mature sucking or chewing patterns and may affect the child's ability to grade the jaw opening for feeding as well as vowel and consonant production.
 - b. A hyperactive gag response, which may interfere with the acceptance and manipulation of food and the production of lingua-velar consonants.
 - c. Retention of a reflex sucking pattern, which will only delay the acquisition of chewing skills and more refined tongue movements for

adjustments prerequisite to advanced sound play.

- d. Retention of the rooting reaction can precipitate head turning or extension every time the child's face is touched. This may trigger the elicitation of abnormal reflexes causing hypertonicity.
4. Inability to voluntarily control the oral mechanism may cause:
 - a. An inadequately controlled bite, which may interfere with the acceptance of hard food substances.
 - b. Inadequate jaw grading, which may interfere with a controlled mouth opening for a variety of foods.
 - c. Inadequate oral control, which may interfere with the oral imitation necessary for the development of chewing, drinking, and sound production.

If it is agreed that feeding difficulties are an indicator of later motor-speech problems, then early assessment and intervention are possible. One does not wait until speech develops. The parents also may become a vital part of the program because feeding management can be incorporated into their daily routine. Involving the parents as soon after a diagnosis of cerebral palsy is made is very

important. The family can then develop positive ways of dealing with the child's problems before they become frustrated or develop maladaptive ways of dealing with the situation. As an added benefit, the child receives therapy all day long at home.

To the Neurodevelopmental Treatment speech pathologist with an interest in cerebral palsy, it is critical that she become prepared to serve these children in infancy with programs that meet their overall development and communicative needs. "The speech pathologist following this concept of treatment ideally becomes a part of a team with the occupational and physical therapist." "All implement the same basic program." "Ideally the speech pathologist has received special training in this approach, which makes her more than just a speech pathologist working with the cerebral palsied" (Morris, 1970).

Chapter 6

CONCLUSIONS

My experience with the Neurodevelopmental Treatment approach has been limited to a review of the literature, an individual feeding therapy case, and participation in a feeding clinic at the Child Development and Rehabilitation Center (DCRC), a division of the University of Oregon Health Sciences Center at Portland, Oregon. These experiences have raised some questions in my mind as well as helped me form some opinions about Neurodevelopmental Treatment.

The individual therapy was with a five-year-old child who was a severe spastic quadriplegic, functioning at about a three- to five-month level of development. I fed him approximately three to four times a week for about two months. He was strapped into a wedge chair during this time. He had been fed without jaw control, and there was little lip closure when we started. He also rolled his head back and to the sides as he swallowed. The primary technique instigated was the use of jaw control for more stabilization of the head and trunk, more lip closure, and to discourage him from rolling his head back to swallow. The jaw control did improve all of these, and he also began to move towards

the spoon as food was presented. Drinking from a cup that was held for him also improved because the lip closure prevented much of the liquid from escaping from the sides of the cup. What seemed to me to be the two most important developments occurring during the therapy period (approximately two months) were a) better head and trunk stability and b) more vocalizations (vowels) during feeding time.

These improvements also were reported by the foster mother, classroom teacher, and physical therapist. I felt that the techniques used did help to increase vocalizations. It was my feeling that the improved head and trunk stability helped the respiratory system function more efficiently and allowed the articulators to move more independently of each other. However, there could be a number of other reasons causing these changes, such as his greater familiarity with me, a growth in the nervous system having nothing to do with the Neurodevelopmental Treatment techniques used, and many other things. Because my externship at CDRC was over, I could not continue with this child; consequently, I can only guess as to how his speech will develop. My best guess is that he will babble, using some of the early developing phonemes at least. However, whether this will be due to feeding management is the question and whether he will ever acquire usable verbal speaking skills also is a question.

In the feeding clinic, I did not see any return

cases because of the short time I was at CDRC. However, there is good followup with these children, and from reading their charts there did seem to be definite improvement in feeding abilities. There often were reports of increased vocalizations as well. However, in my opinion, there were a number of variables that could have caused this. For example, simply changing the child's medication to one that reduced his seizure activity often produced dramatic changes and could have caused more vocalizing. Therefore, to me it was not always clear whether the Neurodevelopmental Treatment techniques were the primary factor. For those professionals at CDRC using Neurodevelopmental Treatment over long period, there is no doubt in their minds that it does work. These are the professionals, then, who have the responsibility to provide the very necessary research about these techniques.

At CDRC, data were being kept on these children as to return visits, placement, recommendations made, and filming was being done on the development of feeding skills. However, I feel more hard data need to be collected, and there is a prime opportunity to do so at CDRC: for example, recording actual increases in vocalizations, noting when bilabial sounds begin, and how long lip closure was worked on before this, noting when babbling occurs and whether later learned sounds develop, as well as many other things.

Although I have just questioned the primary

importance of Neurodevelopmental Treatment--whether its techniques actually help develop motor speech--I think that it does at least provide a more normal physical basis from which motor speech can develop. It only makes sense to me that children who are controlled by atypical or stereotyped motor patterns need help in performing more normal patterns. The positioning techniques used in Neurodevelopmental Treatment help to establish these normal patterns. The head and trunk stability allow the respiratory system to work more efficiently and provide the stability necessary for the articulators to work independently of each other. The jaw control allows the child to use more lip closure, jaw grading, and other skills. All of these abilities are logically necessary for motor speech to develop, and Neurodevelopmental Treatment seems to be helping the child gain these skills.

However, the basic issue is whether the motor speech actually does improve with improvement in feeding and other more primitive physical activities. Although this is reported and I have heard increased vocalizations supporting this relationship, there is very little hard data supporting this. Moreover, there are many other variables that could be causing these effects. I think this is where the controversy lies for many speech pathologists. It is a technique that I would like to learn more about, as would other professionals. However, the waiting lists for courses being

taught on the subject are phenomenal. There are more instructors being trained, but this seems to be a slow process. I also question the fact that when Neurodevelopmental Treatment speech pathologists complete their training they sign a statement not to reveal these techniques to the untrained. The reasoning, that without the basic knowledge the techniques may be harmful, makes sense to a point. However, this secrecy lends mistrust to a technique that I feel has at least good potential. It also does not allow an open environment where needed research can take place. This is necessary to collect data as well as possibly modifying and improving the techniques already being used on the basis of research findings.

To those trained in Neurodevelopmental Treatment, it is the best technique developed so far. It seems that more research and open evaluation of this technique are needed so that all speech pathologists dealing with cerebral palsied children can familiarize themselves with it and then make their own decision as to its effectiveness.

BIBLIOGRAPHY

Books

- Colangelo, Cheryl, Adrienne Bergen, and Linda Gottlieb. A Normal Baby: The Sensory-Motor Processes of the First Year. Valhalla, New York: Blythedale Children's Hospital, 1976.
- Crickmay, Marie. Speech Therapy and the Bobath Approach to Cerebral Palsy. Springfield, Illinois: Charles C. Thomas, 1966.
- Finnie, Nancy R. Handling the Young Cerebral Palsied Child at Home. New York: E. P. Dutton & Co., 1975.
- McDonald, Eugene T., and Burton Chance. Cerebral Palsy. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964.
- McKibbin, Elsie, and Harriet Cloud, eds. Feeding the Handicapped Child: Proceedings of the Conference for University Affiliated Programs. Birmingham: University of Alabama, 1976.
- Morris, Suzanne Evans. Program Guidelines for Children with Feeding Problems. Edison, New Jersey: Childcraft Education Corp., 1977.
- Mysak, Edward D. Neuroevolutional Approach to Cerebral Palsy and Speech. New York: Columbia University Teachers College Press, 1973.
- Pearson, Paul H., and Carol Williams. Physical Therapy Services in the Developmental Disabilities. Springfield, Illinois: Charles C. Thomas, 1972.

Articles, Papers, and Periodicals

- Bobath, Berta. "The Very Early Treatment of Cerebral Palsy," Developmental Medicine and Child Neurology, IX (August, 1967), 373-390.
- Bosley, Elizabeth. "Development of Sucking and Swallowing," The Cerebral Palsy Journal, XXVI, No. 6 (1965), 14-16.

- Ingram, T. T. S. "Clinical Significance of the Infantile Feeding Reflexes," Developmental Medicine and Child Neurology, IV (April, 1962), 159-169.
- Kong, Elizabeth. "Very Early Treatment of Cerebral Palsy," Developmental Medicine and Child Neurology, VII (April, 1966), 198-202.
- Levitt, Sophie, and Carol Miller. "The Interrelationship of Speech Therapy and Physiotherapy in Children with Neurodevelopmental Disorders," Developmental Medicine and Child Neurology, XV, No. 8 (1973), 188-193.
- Schmidt, Paula. "Feeding Assessment and Therapy for the Neurologically Impaired," AAESPH Review, XV (February, 1974), 23-26.
- U.S. Department of Health, Education and Welfare. Public Health Services Administration. Bureau of Community Health Services. Feeding the Child with a Handicap. Washington, D.C.: Government Printing Office, 1975.

Miscellaneous

- Cunningham, Lillian. Personal interview. Portland, Oregon, October 24, 1978.
- Meek, Merry. Personal interview. Portland, Oregon, September 29, 1978.
- Morris, Suzanne Evans. "A Rationale for Pre-Speech Therapy with the Cerebral Palsied Infant: Its Role in the Prevention of Communication Disorders." Paper presented at the meeting of the American Speech and Hearing Association, 1971.
- _____. "Bobath Neurodevelopmental Treatment in Speech Therapy." Paper presented at the meeting of the Annual International Convention of the Council for Exceptional Children, April 23, 1970.
- _____. "Sensori-Motor Evaluation of the Speech Mechanism: A Rating Scale for the Measurement of Pre-Speech Behaviors from Birth Through Three Years." Unpublished manual. Milwaukee, n.d. (Mimeographed).
- _____, and Sandra Stockdale Weber. "Complete Training Manual for Infant and Young Cerebral Palsied Children." Unpublished manual. Milwaukee, n.d. (Mimeographed).

Mueller, Helen A. "Pre-Speech Evaluation and Therapy."
New York: United Cerebral Palsy Association,
May, 1967.

Wright, Sue. Personal interview. Portland, Oregon,
September 30, 1978.

_____, Elaine Lis, Merry Meek, Elizabeth Young, and
Lillian Cunningham. "Developmental Nutrition and
Feeding Program." Paper presented at Child Develop-
and Rehabilitation Center, Portland, Oregon,
November 24, 1978.