

MENTALLY HANDICAPPED CHILDREN:  
FEEDING AND NUTRITIONAL CARE

by

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**THIS BOOK  
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COMPARED TO THE  
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**THIS IS AS  
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## INTRODUCTION

The philosophy of the World Health Organization concerning children is described as follows:

Every child has the right to develop his potentialities to the maximum. This implies that all children, irrespective of whether or not they suffer from mental or physical handicap, should have ready access to the best medical diagnosis and treatment, allied therapeutic services, nursing and social services, educational and vocational preparation, and employment. They should be able to satisfy fully the needs of their own personalities and become, as far as possible, independent and useful members of the community (1).

Basically, the mentally handicapped individual has the same general needs as other individuals. These are the need for love, acceptance, respect, security, medical and physical care, training, education, recreation, vocational success and guidance (2). The level of self-sufficiency obtained by the mentally handicapped depends upon the nature of the programs and services provided during the retardate's early formative years. Although the cost of adequate care during early childhood is great, these often offset the much more costly need for life-long care and maintenance. It was not until 1967, when President John F. Kennedy first alerted the country to the need for health services for the mentally retarded, that much progress was made in identifying the mentally handicapped and in providing comprehensive health services for them.

The terms "mentally handicapped" and "mentally retarded" are used interchangeably. The American Association of Mental Deficiency (AAMD) defines a mental handicap as "significantly sub-average general intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the developmental period (up to 18 years)" (2). For an individual to be labeled "mentally handicapped" or "retarded," both sub-average intellectual functioning and impaired adaptive behavior must be present.

"Sub-average" (2) refers to performance which is greater than one standard deviation below the population mean of the age group involved on measures of general intellectual functioning. The level of general intellectual operation may be assessed by performance on one or more of the various objective tests which have been developed for that purpose.

Begab et al. (2) define adaptive behavior as "a person's ability to meet those standards of 'social responsibility' and 'personal independence' appropriate for his age and cultural group." Adaptive behavior may indicate impaired maturation, learning and/or social adjustment. The rate of maturation refers to the rate of sequential development of self-help skills of infancy and early childhood. Learning ability refers to the facility with which knowledge is acquired as a function of experience. Social adjustment is assessed in terms of the degree to which the individual is able to maintain himself independently in the community, and to become involved in gainful employment.

In infancy and early childhood, deficits are often observed in sensory motor skills and development, communication skills, self-help skills and socialization. During childhood and early adolescence inadequacies may occur in basic academic skills, daily life activities, application of appropriate reasoning, judgment, mastery of the environment, and social skills.

### MENTAL RETARDATION

Mental retardation is often described in terms of causes, characteristics and degree of impairment.

#### Cause

Causes of mental retardation have been categorized generally as: genetic, prenatal, postnatal, secondary to another condition, cultural deprivation, and unknown (3). The last category comprises over 50% of all mentally retarded. Browning (4) listed seven clinical causes of mental retardation which are as follows:

- 1) Infections and intoxications
- 2) Trauma or physical agents
- 3) Metabolism or nutrition
- 4) Gross brain disease (post natal)
- 5) Unknown prenatal influences
- 6) Chromosomal abnormality
- 7) Gestational disorders

#### Characteristics

Frankell et al , as reported in Canadian Nutrition Notes (5), have recorded general physical and mental characteristics common to many retarded children. They include:

- 1) Apathy
- 2) Impulsiveness - lack of behavior control
- 3) Emotional instability - fluctuation of mood
- 4) Distractibility
- 5) Low stamina, easily fatigued
- 6) Motor disabilities - spasticity, palsy
- 7) Over dependence on others
- 8) Lack of curiosity
- 9) Sensory impairment - defective sight or hearing
- 10) Disorders of perception - short attention span
- 11) Disorders in concept formation
- 12) Language disorders
- 13) Social incompetence

The development characteristics of mentally retarded children are found in Table 1.

#### Degree of retardation

The most extensive system for classifying the mentally handicapped has been developed by the AAMD. This system is based on the individual's current level of functioning. Classification, therefore, is a continual process and changes from time to time. Instead of using I.Q. scores, the AAMD uses standard deviation units as a basis for determining the individual's intellectual functioning (Table 2). Standard deviations have the advantage of comparing I.Q. scores obtained from different tests at various times.

A positive relationship exists between adaptive behavior and intelligence. The degree of retardation varies greatly from individual to individual. A widely accepted classification of the degree of mental retardation based on intelligence quotients is (3):

TABLE 1  
Developmental characteristics of mentally  
retarded children (6)

Level	Pre-school age 0-5 years Maturation and development	School age 6-20 years Training and education
Mild	Can develop social and communication skills; minimal retardation in sensorimotor areas; often not distinguished from normal until later age.	Can learn academic skills up to approximately 6th grade level by late teens. Can be guided toward social conformity. "Educable."
Moderate	Can talk or learn to communicate; poor social awareness; fair motor development; profits from training in self-help; can be managed with moderate supervision.	Can profit from training in social and occupational skills; unlikely to progress beyond second grade level in academic subjects; may learn to travel alone in familiar places.
Severe	Poor motor development; speech is minimal; generally unable to profit from training in self-help; little or no communication skills.	Can talk or learn to communicate; can be trained in elemental health habits; profits from systematic habit training.
Profound	Gross retardation; minimal capacity for functioning in sensorimotor areas; needs nursing care.	Some motor development present; may respond to minimal or limited training in self-help.

TABLE 2  
Classification of mental retardation according to  
level of intellectual functioning (4)

Standard deviation units	1961		1973	
	Level	Standford- Binet	Wechsler Scales	Level
-1.01 to -2.00	Borderline	83-69	84-70	
-2.01 to -3.00	Mild	68-52	69-55	Mild
-3.01 to -4.00	Moderate	51-36	54-40	Moderate
-4.01 to -5.00	Severe	35-20	39-25	Severe
-5.01+	Profound	20-0	24	Profound
				-2.01 to -3.00
				-4.01 to -5.00
				-4.00 to -5.00
				-5.01+

<u>Classification</u>	<u>I.Q.</u>
Average intelligence	90-100
Slow learner	80-90
Educable mentally handicapped	50-80
Trainable mentally handicapped	35-50
Custodial mentally handicapped	below 35

Still another classification, used by Kirk (7), places mentally defective children into three categories, from lowest to highest as follows:

<u>Lowest</u>	<u>Middle</u>	<u>Highest</u>
Idiot	Imbecile	Moron
Dependent	Semi-dependent	Marginal independent
Untrainable	Trainable	Educable
Low grade	Middle grade	High grade
Very severe	Severe	Moderate
Custodial	Severely retarded	Retarded
I.Q. 0-25	I.Q. 25-50	I.Q. 50-75

It should be noted that the expressions "idiot," "imbecile" and "moron" are psychiatric terms whereas "untrainable," "trainable" and "educable" refer to educational processes. The maximum mental age at maturity for educable, trainable and custodial handicapped is 7-10 years, 3-8 years, and below 3 years, respectively (3).

### Incidence

Within a given population, approximately 3 percent are mentally retarded persons. The percentage of a given population identified as being mentally retarded is a function of 1) the criteria used to identify the retarded; 2) the socioeconomic level of the community; and 3) the age range sampled (8). In 1974, there were 1,507,000 mentally handicapped children in the United States, or 2.3% of the total population (8).

The congenital abnormalities present in the mentally handicapped require management and treatment by professionals in the field of developmental disabilities (9). Attention needs to be given by professionals to nutrition, especially for feeding problems associated with chewing and swallowing. A highly significant skill to be acquired by a retardate is that of self-feeding (10). Independence in feeding, as well as acceptance at the family table and in public, is of major psychological importance to the mentally handicapped child.

#### DEVELOPMENTAL FACTORS INVOLVED IN FEEDING

There are no basic principles of feeding which can be applied to all physically and mentally handicapped individuals. Psychological methods and physical procedures employed to control mealtime behavior of the mentally handicapped child will vary from one to the other. The ability to feed oneself is not only life-sustaining but allows for therapy to occur in other areas. Endres and Thaman (11) believe that the retarded child has possibilities for achievement in the area of feeding that are not fully recognized by family or professionals. They demonstrated that feeding techniques can be used to stimulate the child in areas of physical, psychological and social development. All children have behavior potentials which need to be developed, especially in the area of social adaptation. Many retardates receive appropriate social stimulation through food service and the type of food served. Thus their social functioning becomes more effective. Since optimum nutrition is essential to physical and mental development, it is important that an adequate feeding pattern be established at the earliest possible age.



According to Huff (12), "a mentally retarded child born today is lucky. Not because of his handicap, but because for the first time in this century, that child will have an opportunity to grow, develop, learn, and hopefully live a rewarding life." Numerous community resources now provide handicapped persons with the special attention they need to overcome their limitations.

The mentally handicapped, like all others, is first of all an individual and should be managed accordingly. Feeding problems should be considered in terms of rate of physical and mental development, rather than chronological age. Nutritional needs as determined by age are modified in accordance with the individual's specific illness, handicapping condition, or required medications. Children whose physical or mental condition require drug therapy may have special nutrient needs. Anticonvulsant or stimulant medication often affects the appetite and/or nutrient metabolism (9). Many of the difficulties which center around motor development and coordination include swallowing, sucking, chewing, saliva control and tongue manipulation (13).

#### Motor development

Motor accomplishments follow a fairly set pattern in normal infants and children. The development of body control usually proceeds from the regulation of the head through the trunk to the legs, then from the center of the body, outwards through the arms and legs. Deviations from these norms become important diagnostic clues as to the normal or delayed development of the child.

The following reflexes are usually present at birth or soon thereafter and provide the basis for early pediatric examination (14).

1. The "sucking and taste" reflexes are present soon after birth.
2. The "rooting" reflex allows the infant to find the nipple without being directed to it. The baby turns his head to the side which is stroked next to the lip.
3. With the "tonic neck" reflex, the child extends his arms and leg on the side to which the head is facing. He simultaneously flexes the extremities on the opposite side when he has been in the supine position and his head turns quickly to one side. This reflex normally disappears by the age of two or three months.
4. The tendency of the hand to close tightly upon stimulation of the palm is composed of the "grip" reflex and the response to traction. When an object is placed into the palm, the child will flex his fingers and grip the object. This reflex weakens after the second month and disappears in most normal babies by the end of the third month.
5. The Moro reflex is always present in normal infants and disappears at about three months of age. When the baby is in a supine position with head supported about 1 inch above the surface and there is a rapid release of support, the arms and legs will spread apart and then be brought together.
6. The "plantar" reflex depends on the maturing of the nerve centers. It is normally obtained after the first month of life and disappears by the age of 8 months. When the sole of the foot is pricked, a withdrawal reaction results. When the infant is held in a perpendicular position,

this stimulus should cause movement of the limb away from the stimulus and movement of the opposite limb toward it.

7. If the Babinski response is displayed beyond the age of 24 months it is indicative of some neuropathology. In this reaction, the big toe extends upward and the remaining toes fan downward when the sole of the foot is stimulated.

A determination of motor control of the head and trunk is required in feeding the mentally handicapped child (15). The natural position for an infant to take food is "in a semirecumbent, flexed posture with the head held in a neutral position and the neck protected from any marked position of extension" (15). The feeding position for the mentally handicapped child should be such that it breaks up the motor pattern of the tonic neck reflex, total hyperextension, or hyperflexion of the body. The feeding posture should also allow isolated movements of the arms, head, jaw, tongue, and lips (16). Symmetry of the child's body is important. The flexed position of the neck allows ease in swallowing. Neck extension inhibits or hinders the muscles involved in swallowing.

At about six months of age, a child may be placed in an upright position for eating. "The upright sitting position is most efficient for ingesting food as the forces of gravity assist peristalsis and muscular activity in the esophagus" (15). To be safe in a highchair for meals, the child should display responses of protective extension. Table 3 contains developmental characteristics of a normal child. Between eighteen months and two years of age a normal child is usually coordinated well enough to sit in a chair without confinement. For

TABLE 3  
Some developmental characteristics of the  
normal child (17)

Motor skills		Feeding skills	
1 to 3 months			
1. Holds head up briefly when prone		1. Sucking reflex present	
2. Head erect and bobbing when supported in sitting position		2. Rooting reflex present	
3. Head erect and steady in sitting position		3. Ability to swallow pureed foods	
4. Follows objects through all planes		4. Coordinates sucking, swallowing and breathing	
5. Palmar grasp		5.	
6. Moro reflex			
4 to 8 months			
1. Sits with minimal support, with stable head and back		1. Tongue used in moving food in mouth	
2. Sits alone steadily		2. Hand-to-mouth motions	
3. Plays with hands, which are open most of the time		3. Recognizes bottle on sight	
4. Grasps rattle or bottle with both hands		4. Gums or mouths solid food	
5. Picks up small objects		5. Feeds self crackers	
6. Transfers toys from one hand to the other			
7. Neck-righting reflex			
9 to 12 months			
1. Rises to sitting position		1. Holds own bottle	
2. Creeps or crawls, may be backward at first		2. Drinks from cup or glass with assistance	
3. Pulls to standing position		3. Finger feeds	
4. Stands alone		4. Beginning to hold spoon	
5. Cruises			
6. Uses index finger to poke			
7. Finger-thumb grasp			
8. Parachute reflex			
9. Landau reflex			

TABLE 3 (cont'd)

Motor skills		Feeding skills
13 to 18 months		
1. Walks a few steps without support		1. Holds cup and handle with digital grasp
2. Balanced when walking		2. Lifts cup and drinks well
3. Walks upstairs with help, creeps down		3. Beginning to use spoon, may turn bowl down before reaching mouth
4. Turns pages of book		4. Difficulty in inserting spoon into mouth
		5. May refuse food
19 to 30 months		
1. Runs		1. Drinks without spilling
2. Walks up and down stairs, one at a time (not alternating feet)		2. Holds small glass in one hand
3. Imitates vertical strokes		3. Inserts spoon in mouth correctly
4. Imitates building tower of four or more blocks		4. Distinguishes between food and edible material
5. Throws ball overhand		5. Plays with food
6. Jumps in place		
7. Rides tricycle		
31 to 48 months		
1. Walks downstairs (alternating feet)		1. Pours well from pitcher
2. Hops on one foot		2. Serves self at table with little spilling
3. Swings and climbs		3. Rarely needs assistance
4. Balances on one foot for 10 seconds		4. Interest in setting table
5. Copies circle		
6. Copies cross		
7. Draws person with three parts		
49 to 52 months		
1. Balances well		1. Feeds self well
2. Skips and jumps		2. Social and talkative during meal
3. Can heel-toe walk		
4. Copies square		
5. Catches bounced ball		

the child who is unable to sit independently, he should be held or positioned in a semi-reclined position with the body supported.

Choking with vomit is a real danger with the mentally handicapped, especially if they are fed in the wrong position. Retarded children are sometimes fed lying down. If he does not swallow in this position he is apt to choke. Other feeding disabilities associated with handicapping conditions are listed in Table 4.

#### Oral-pharyngeal development

A detailed oral-pharyngeal evaluation is necessary before a suitable training program can be devised (15). The reflexes of rooting, sucking, swallowing and biting are the basic movement patterns of feeding during infancy (15). A gross primitive reflex may remain for a prolonged period of time. Also, it may be so strong that it interferes with the individual's eating ability.

Impaired coordination of jaw, lip and tongue muscles, and difficulty in swallowing are among the earliest, and perhaps easiest detectable signs of central nervous system (CNS) inadequacy (16). These manifestations of mental retardation are often initially observed during feeding.

The significance of the functions of rooting, sucking, swallowing and biting is related to the sequence of their actions as the child eats. The rooting reflex is initiated by a touch stimulus. In the normal child the rooting response is present at birth. It becomes gradually weaker and disappears at about three months of age. For some handicapped children, especially those with cerebral palsy, the rooting response may remain much longer.

TABLE 4  
Handicapping conditions and feeding disabilities (18)

Handicapping conditions	Feeding disabilities				
	Inability to suck, close lips	Inability to chew, bite swallow	Poor grasp	Poor hand-mouth coordination	Poor trunk and upper extremities control
Cerebral vascular accident with facial paralysis with hemiplegia on dominant side	x	x	x	x	x
Cerebral palsy athetoid type ataxic type spastic type	x	x	x x-	x x x-	x x x
Traumatic spinal cord injury paraplegia quadraplegia			x	x	x
Muscular dystrophy Duchenne's fascio-scapular-humeral	xx	x	x x	x x	x x
Multiple sclerosis	x	x	x	x	x
Parkinson's disease	x	x	x	x	x
Myasthenia gravis			x	x	x
Rheumatoid arthritis			x	x	x-
Severe and profound mental retardation	x	x	x	x	x

x Moderate; xx Severe; x- Varies.

The sucking-swallowing reflex is brought about by placing an object between the lips and into the mouth. The lips move in a grasping-like motion, the tongue reacts and the lips close. Swallowing is a complex mechanism since air passages are located in front of the esophagus. All food must pass across the epiglottis and there is the risk of choking. Liquid entering the lung may result in pneumonia. Such dangers are very real for the mentally handicapped child. This is especially true for the spastic, who can take only a small quantity of food at one time. Swallowing is slow, hence feeding time is prolonged. As spastic children develop they protect themselves by resisting efforts of rapid feeding and by keeping food in their mouth until they are ready to swallow.

In the child with cerebral palsy, there may be a protrusion of the tongue over the lower jaw. To complete the feeding process, the swallowing reflex is needed. This is triggered when saliva and food make contact with the back of the tongue, the soft palate, and the back of the pharynx and epiglottis.

Biting is the last basic movement pattern of feeding to be displayed during infancy. It may be present until the ninth month of life. This automatic response is initiated by placing a fingertip firmly on both gums with continuous pressure. The individual will bite vertically until the stimulus is released. Children with cerebral palsy often have a prolonged strong biting reflex which may be induced by the least bit of pressure on the gums or touch of the teeth (16). The biting reflex is replaced by chewing which requires concentrated volitional or willing lateral and rotary movements of the jaw.



Lip prehension or grasping must be strong enough to close the lips to prevent leakage of saliva from the mouth. Excessive drooling is usually seen in connection with poor lip closure and weak swallowing. Gagging is the contraction of the constrictor muscles of the pharynx. The gag reflex is a protective mechanism. Gagging as well as coughing prevents the aspiration of food. Both occur as a result of pressure at the middle of the tongue and back of the uvula, the posterior portion of the soft palate. The gag reflex becomes much weaker after the seventh month when chewing has begun.

Mueller (16) observed a close relationship between the gag reflex and oral tactile sensitivity. Children fed through a nasal gastric tube display highly exaggerated oral tactile sensitivity. When tube feedings are discontinued, the gagging decreases. Mueller therefore concluded that gavage feeding causes strong oral overstimulation (16).

### The tongue

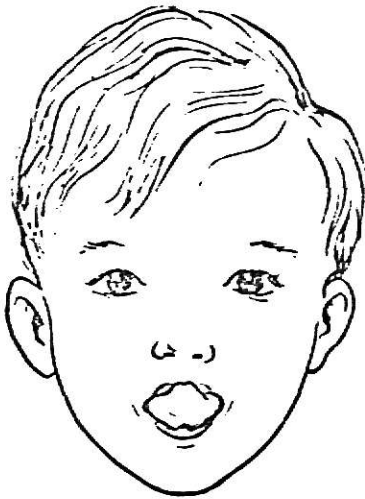
The tongue is a prehensile limb. It is capable of grasping or seizing. During the eating process, the tongue moves the bolus of food within the mouth and positions it between the teeth for chewing. Soft foods which require no chewing are moved directly towards the esophagus. Tongue thrusting is observed when the child presses the tongue upward on the roof of the mouth, and then outwards between the gums or teeth and lips. When this occurs in older children, it interferes with the ability to keep the lips and mouth closed. If tongue thrusting is forceful, the child appears to be pushing more food out of his mouth than he is swallowing.

In the normal newborn, the tongue is restricted in movement (19). There may be some curling of the lateral margins, but with no well-defined mobility. Backward and forward movement may appear at four to twelve weeks. This can be observed when the tongue involuntarily ejects food. As the tongue comes under voluntary control, it becomes more flexible, and food is compressed and shifted about before swallowing. For proper mastication, the tongue serves the function of mixing the food with saliva and in keeping it pressed between the grinding surfaces of the teeth. After food has been moistened and lubricated by saliva, it is rolled by the tongue and hard palate into a bolus and is forced into the pharynx by the tongue.

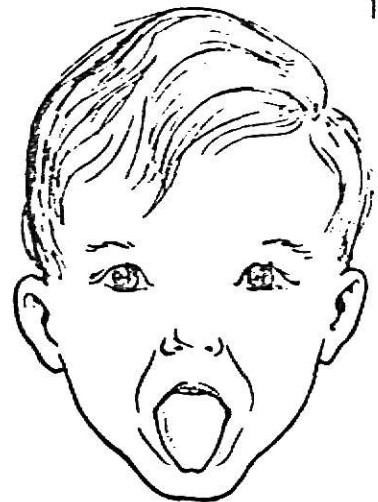
In the mentally handicapped child, tongue abnormalities may preclude some of these functions of the tongue. These abnormalities may be the result of neurological deficits.

The normal tongue position is at the floor of the mouth (20). Lip closure and tongue position are factors which affect the progress of sucking and eating. Lip and tongue motions used in eating are shown in Fig. 1.

Gaffney and Campbell (20) suggested methods of stimulating tongue muscles by ice or with a tongue depressor. If tongue protrusion is a problem, pressure is applied on the soft tissue under the mandible. A tongue depressor can be "walked" from the tip of the tongue to the dorsum--to inhibit tongue thrust and to decrease the gag reflex.



Tongue protrusion and upward motion.



Tongue protrusion and downward motion.



Lateral movement of tongue.



Downward motion, tongue behind lower teeth.



Pursed lips for sucking, blowing.



Upward motion of tongue to touch upper teeth, to clear food from teeth and roof of mouth.

Fig. 1. Lip and tongue motions used in eating (21)

### Eye-hand coordination

Healthy newborn infants usually have good reflexive palmar grasp within the first one or two days of life. This reflex remains until the child is about three months of age. Taft and Cohen reported that sucking movements facilitate grasping (21). An infant's grasping reflex is significantly greater before eating than after. In the normal child, this reflexive movement is not detrimental to eating. However, if it persists, as it often does in the handicapped child, beyond the time when the child is ready to begin finger feeding, he will not be able to grasp or release objects at will (22).

Visual coordination and eye following are integral parts of feeding (23). When a normal child sees a filled spoon moving toward him, he automatically opens his mouth to receive it. This demonstrates a classic response of the role of conditioned reflex activity (24).

The palmar-mental reflex may be present in mentally handicapped children (24). The jaw remains in strong extension with the mouth wide open when pressure is applied to the upper part of the palms of the hands. The child's eyes may also close when the stimulus is applied. If this reflex is quite strong and the child's hands are restrained by holding them together during the feeding process, the mouth remains open as long as the pressure on the hands continues. The mouth will not be closed for ~~chewing~~ and swallowing until the pressure on the palms is released.

### Tactile sensitivity

Eating is interfered with when there are abnormalities of sensory input related to touch (15). Contact with the face or inside of the

mouth is unpleasant to some children. Hence, they resist any activity involving facial contact. These responses may be diminished by firm handling. Light touch has a more intense sensory input than a firm touch (15).

#### Function of general musculature

Generalized muscle weakness may affect the child's ability to open and close his mouth, swallow, or maintain the upright position required for eating (15). The presence of facial expression and the manner in which it spreads over the face is indicative of muscular function. The movements of facial muscles are the basis of facial expression: they form radiating and circular "frames" of the mouth, nose and eyes. The muscles arranged in a radiating pattern are widened whereas those that are circularly patterned are narrowed. The reaction may spread to a non-stimulated sensory organ that also will be opened or closed. Then the process is termed "spreading reaction" (24).

In the mentally handicapped child with athetosis (repetitive involuntary gross movements), the facial expression is fluctuating and mobile. The facial expression of a child with excessive hypertonicity (abnormal tension), however, changes slowly and is exaggerated in its final state. An example of this is the "ear to ear" smile of the spastic child. Ogg has suggested that if athetosis, spasticity, or decreased tone is seen in the facial muscles, these conditions may also be present in the neck and trunk (15).

According to Piaget (26), early cognitive development is related to sensory motor function. Physical movement is the means of expressing

social behavior. The progression from reflexive actions, to primary, to secondary and tertiary circular reactions is important in the evaluation of feeding capabilities of children. This permits appropriate related activities to be introduced when the child is ready for specific tasks.

The infant's early exploration of the world is accomplished through his mouth. Normal oral function is essential for the development of personal interactions. After many repetitions, these interactions are applied to new situations in the environment. In this way the complexity of behavior is increased. Food intake with its sensory feedback is considered to be a significant factor in intellectual development.

In the normal child, motor and sensory activities are developed in the following sequence: rooting, sucking, grasping, seeing, hearing and speaking (23). Any of these patterns may be grossly abnormal and/or arrested at a primitive level in the child with mental and physical handicaps.

The physiological needs of each individual must be evaluated by an interdisciplinary team to determine the capabilities as well as the disabilities of each child. The mentally handicapped child can be educated if the proper procedures are utilized. Ebersole, Kephart, and Ebersole (27) outlined the following steps to identify the appropriate level for teaching the slow learner:

- 1) Tolerance level--easy for the child to work.
- 2) A level at which it is a challenge to apply himself.
- 3) A level at which it is frustrating to try.

Activities which can be accomplished and are a challenge are enjoyed. They are likely to be repeated. If the tasks presented are overwhelming, they easily become frustrating.

The spontaneous feeding behavior of a child tells much about his oral development. Feeding is the forerunner of speech. Blanchard (28) stated that "the natural exercise of tongue and lips is necessary to prepare these structures for later use in talking." The way food is presented to a child allows the lips and tongue to become ready for articulation. Thus, the potential for speech can be enhanced by allowing the child to take full advantage of his sucking and swallowing mechanisms.

Collins (29) observed that the articulators of speech, viz., mandible, lips, teeth, tongue, hard and soft palates--are also used in feeding. Any defect in the function or structure of these parts of the mouth may affect feeding as well as speaking. It should be noted that labial and palatal clefts are the most common congenital structure deviations.

#### Growth of the mentally handicapped child

The mentally handicapped child can not be evaluated for growth against conventional norms as their physical development is often retarded (30). Growth deviations in handicapped children were investigated by Pryer and Thelander (31). Three classifications of handicapping conditions were studied--Down's Syndrome, multiple abnormalities present at the time of birth (congenital) and cerebral palsy. Fourteen anthropometric measurements were taken on 678 handicapped children. There were differences in the pattern of growth and development among the three groups. Children with Down's Syndrome were of below average height at all ages. A lag in trunk measurements was observed at 8-9 years of age. Body measurements for children with cerebral palsy were

normal until the age of ten years. Children with this condition and multiple congenital anomalies did not demonstrate the customary adolescent growth spurt. Head size, which is determined by cephalic measurements of circumference, length and breadth, depends upon brain growth. Small heads and pinched faces were observed in children with cerebral palsy as well as other congenital abnormalities. Pryer and Thelander (31) concluded from their anthropometric data that deviations from normal growth result from basic relations between the growth of different parts of the body.

In a survey of mentally retarded children, Roberts and Clayton (32) found that the more severe the mental retardation, the greater the deceleration of growth. In the mild and moderate category (I.Q. 50-78 and 25-50, respectively) the number of children below the 3rd percentile was about 5 1/2 times the expected figure; in the severely subnormal classification (I.Q. below 25) the total was approximately 11 times the expected number.

#### ASSESSMENT OF FEEDING PRACTICES

The initial step in distinguishing the feeding problems of any child, whether mentally handicapped or normal, is to obtain a dietary history and an assessment of nutrient intake and feeding methods. This is accomplished by parent interview and direct observation.

"Assessment, prior to training, must be made so that information is geared to the present condition and any change can be measured later" (33).  
"The purpose of a nutritional evaluation is to assess the nutritional



history and present status of the child in order to determine whether his nutrition is affecting or has affected his health and his ability to function" (34). "The overall aim in feeding assessment is to encourage as much independence as possible in the child, while maintaining motivation and preventing excessive frustrations" (33).

#### Related measurements

There are multiple causes and symptoms of nutritional deficits. Clinical observations and biochemical analyses are correlated with the dietary evaluation. Nutrients of marginal intake can be determined by dietary appraisal. Biochemical determinations will indicate abnormalities in body fluids. Clinical observations appear following extended periods of nutritional deprivation. Clinical signs of nutritional status are shown in Table 5.

Medical and dental examinations will determine growth patterns, excessive food intake in the form of adipose tissue, and physical signs of specific nutrient inadequacies. The pattern of growth is an important indicator of nutritional status. The slowing or cessation of growth may result from a prolonged deficiency of one or more nutrients. The length of the deprivation and the rate of the child's growth during a given time span are factors to consider.

A child's height and weight are important anthropometric measures. Head and chest circumference are desirable measurements for infants and preschoolers. Arm circumference is often determined for older children. The purpose of skinfold thickness determinations is to obtain an

TABLE 5  
Clinical signs of nutritional status (35)

	Good	Poor
General appearance	Alert, responsive	Listless, apathetic, cachexic
Hair	Shiny, lustrous; healthy scalp	Stringy, dull, brittle, dry, depigmented
Neck (glands)	No enlargement	Thyroid enlarged
Skin (face and neck)	Smooth, slightly moist, good color, reddish-pink mucous membranes	Greasy, discolored, scaly
Eyes	Bright, clear; no fatigue circles beneath	Dryness, signs of infection, increased vascularity, glassiness, thickened conjunctiva
Lips	Good color, moist	Dry, scaly, swollen, angular lesions (stomatitis)
Tongue	Good pink color, surface papillae present, no lesions	Papillary atrophy, smooth appearance, swollen, red, beefy (glossitis)
Gums	Good pink color; no swelling or bleeding, firm	Marginal redness or swelling, receding, spongy
Teeth	Straight, no crowding, well-shaped jaw, clean, no discoloration	Unfilled caries, absent teeth, worn surfaces, mottled, malposition
Skin (general)	Smooth, slightly moist, good color	Rough, dry, scaly, pale, pigmented, irritated, petechia, bruises
Abdomen	Flat	Swollen
Legs, feet	No tenderness, weakness, or swelling; good color	Edema, tender calf, tingling, weakness
Skeleton	No malformations	Bowlegs, knock-knees, chest deformity at diaphragm, beaded ribs, prominent scapulae

TABLE 5 (cont'd)

	Good	Poor
Weight	Normal for height, age, body build	Overweight or underweight
Posture	Erect, arms and legs straight, abdomen in, chest out	Sagging shoulders, sunken chest, humped back
Muscles	Well developed, firm	Flaccid, poor tone; undeveloped, tender
Nervous control	Good attention span for age; does not cry easily, not irritable or restless	Inattentive, irritable
Gastrointestinal function	Good appetite and digestion; normal, regular elimination	Anorexia, indigestion, constipation or diarrhea
General vitality	Endurance, energetic, sleeps well at night; vigorous	Easily fatigued, no energy, falls asleep in school, looks tired, apathetic

independent measure of body fatness. Weight alone represents body lean and/or fat tissue.

Many mentally handicapped children are small for their age (32). Frequently small size indicates less than optimal nutrition or evidence of factors responsible for the handicap. When small size occurs, a determination should be made as to its cause. It is known that chromosomal abnormalities, congenital malformations, CNS damage and neuromuscular pathology may cause growth retardation. The parts of the body most likely to show signs of nutritional deprivation include the skin, mouth (lips, tongue, gums, teeth), skeletal structure, and nervous system.

Biochemical methods are more objective and precise in evaluating nutritional status than clinical methods. Yet, procedures used depend upon each individual. Blood or urinary levels of nutrients are quite variable and may represent only the previous day's food intake. Tests which measure function (eg. pyruvic acid level of the blood as an indicator of thiamin adequacy) are superior to those measuring the level of circulating nutrients (34). The former indicate actual cellular performance whereas the latter are indicative of intake. An indirect biochemical measure of nutritional assessment is a determination of hemoglobin and/or hematocrit level. A single determination, namely hemoglobin and/or hematocrit, reflects intake and utilization of numerous nutrients such as protein, iron, and various B complex vitamins.

### Diet analysis

In assessing the feeding practices of a mentally handicapped child, an evaluation of the child's food intake is made. This includes the

variety of nutrients consumed as well as amounts of food eaten. Especially important is the need to recognize and evaluate signs of readiness for progress in feeding skills. Other areas to be explored during the initial consultation with a nutritionist are outlined as follows (3):

- 1) Adequacy of present diet
  - a. Typical meal patterns
  - b. Food likes and dislikes
  - c. Ability of family to provide and prepare food
- 2) Attitudes of family - social, cultural, emotional; as they affect the ability of the parent to:
  - a. Provide the recommended diet
  - b. Help the child enjoy eating
  - c. Help the child become independent in the feeding situation
- 3) Special dietary needs
  - a. Medical diet orders (full understanding of aim)
  - b. Relationship of diet order to family food pattern
  - c. Availability of food and finances to purchase
  - d. Methods of using food
- 4) Techniques of feeding
  - a. Where
  - b. When
  - c. How (appropriate eating utensils)
- 5) Degree of independence
  - a. Ability to feed self
  - b. Ability and readiness to chew and swallow

Two ways of analyzing the diet are by a 24-hour recall of food consumed and a 3 or more day diary. Generally, the more days of recording food consumed the more reliable is the estimate of average daily food intake. A food frequency check list corrects the misinterpretation of a "typical day" and provides information about food-buying practices, eating habits of the family, and preferences of the child. In addition, visits to the home by a nutritionist and/or other team member helps to evaluate feeding methods and procedures.

### Nutrient analysis

The simplest way to analyze the nutritional data obtained in a dietary evaluation is to compare the child's average daily consumption of the "basic four" food groups with the recommended number of servings for his age group. This provides a broad indication for areas of possible concern. Specific nutrients may be calculated by using food composition tables such as the United States Department of Agriculture's Handbook No. 456 (36) or those of Church and Church (37). This method represents a rough quantitative measure of the actual nutrients consumed, but is more precise than evaluation by the "basic four."

The concept of the "four food groups" is an attempt to translate the Recommended Dietary Allowances (RDA) into usable dietary patterns for those unfamiliar with nutrient requirements. RDA are used as a basis for interpreting adequacy of food consumption. They are primarily guidelines for feeding groups of healthy people but are also used as a broad indication of the adequacy of an individual's nutrient intake. The RDA represent allowances and not requirements. The latter may vary from one individual to the next. This is true especially for persons requiring drug therapy.

It should be noted that the dietary allowances are higher than dietary requirements. Dietary allowances include a 10 to 50% margin of safety above normal physiological requirements. The amount added differs for each nutrient because of differences in the body's ability to store nutrients, the range of observed requirements, the precision of assessing requirements, and the possible hazards of excessive intake of certain nutrients (38). However, there is no built-in safety margin for calories.

The calorie content of a child's diet is determined by his activity level as well as his sex and age. Since the mentally handicapped child is often small for his age and/or is involved in abnormal activity, there is a tendency to consume inadequate or excessive calories.

Weight can not be evaluated against height when size is abnormal. Culley and Middleton (39) studied the caloric requirements of mentally retarded children with and without motor dysfunction. They concluded that a knowledge of body height allows a reasonable estimate of the caloric needs of ambulatory and non-ambulatory children between the ages of 5-12 years with moderate to profound mental retardation. An ambulatory child is one who can walk unassisted. Children whose motor dysfunction was severe enough to cause them to be non-ambulatory required  $3/4$ ths as many calories as ambulatory children of comparable height. The total number of calories required to maintain a state of good nutrition can be severely reduced if the child is quite short and motor dysfunctions prevent walking. Williams (35) stated that athetoids (repetitive involuntary muscular distortions of the limbs) require a diet high in calories for simple physical maintenance. In contrast, those conditions exhibiting spastic paralysis require fewer calories due to the lack of muscle movement (35).

A dietary assessment is the major tool that allows a nutritionist to anticipate the risk of deficiency of specific nutrients in the mentally handicapped child. However, dietary data need to be correlated with biochemical and clinical data to provide evidence of the existence or absence of malnutrition.

The development of nutrient deficiencies progresses from low dietary intake to biochemical abnormality to clinical manifestation. Hence, a

child may be at risk for months or years before clinical symptoms appear. Nutritional assessment, therefore, should occur on a regular basis, especially during the years of active growth.

### Parent education

Education and counseling of parents of mentally handicapped children can provide appropriate influences for shaping food habits. The nutritionist as a change agent provides information, guidance, and support. The responsibility for change lies within the individual as well as the caretaker.

In the multidisciplinary setting, more effective treatment may be provided by utilizing the disciplines of psychology, physical therapy, social services, speech and occupational therapy, as well as medicine. Short term follow-up is often indicated to help parents initiate necessary changes.

When the child has feeding problems of a mechanical nature, parents need help in developing an awareness of developmental cues that indicate a child's readiness for a change in texture or utensil. This includes reassuring the parent that messiness is acceptable, the child needs practice, and that the learning process is slow.

Parents may need to be made aware of the fact that food serves purposes other than nourishment. Sensory stimuli are provided by variety in shape, color, taste and texture. Fibrous foods can help to cleanse the teeth as well as provide bulk to aid in normal elimination.

Efforts should be made to avoid compounding the burdens of the mentally handicapped child with nutritional inadequacies. There are many supportive organizations which benefit the mentally handicapped



child by providing financial support, appropriate medical treatment, and education. A sample listing of these organizations is:

Handicapped children's early education programs associated with state departments of education

Psychiatric centers

Departments of speech pathology and audiology associated with universities

Local and regional chapters of:

Association for Children with Learning Disabilities

Council of Exceptional Children

Epilepsy Foundation of America

Muscular Dystrophy Association of America

National Association of Mental Health

National Association for Retarded Children

National Association of Sheltered Workshops and Homebound Programs

National Foundation of the March of Dimes

National Multiple Sclerosis Society

National Society for Autistic Children

United Cerebral Palsy Association

## TECHNIQUES AND TEACHING FOR DEVELOPMENT OF FEEDING SKILLS

### Other than by mouth

For the child who is so severely retarded that he can not suck or swallow, food is administered by nasal tube or gastrostomy tube. Also, associated deviations of the gastrointestinal tract may prevent feeding by mouth.

Although a child may be receiving the majority of nutrients via tube feedings, there remains the need for the psychological factors that are normally provided by the feeding situation. To promote emotional maturation, the child should be cuddled and talked to throughout the day. Auditory stimulation combined with close visual regard of the baby's face by the parents is encouraged (24). Discrimination of sounds can be promoted by producing two different sounds in sequence either in or out of the line of vision. These activities will eventually stimulate smiling and oral imitation behavior. When these occur, they are reinforced by tactile, auditory, or visual means. Feeding schedules should be adapted to household routine and more than one member of the family should be taught to feed the child.

The child is generally positioned on his back for insertion of the tube for nasal or gastrostomy feedings. The physician may request the neck be hyperextended. Upon completion of the feeding, the child should be held upright to expel air from the stomach.

#### Feeding by mouth

The child who swallows saliva is fed either by means of a Breck feeder, a bottle with enlarged holes in the nipple, or by spoon feeding. The child is held in a semi-reclining position as previously mentioned, with the body adequately supported. Zinkus (13) listed the following activities to aid in swallowing:

- 1) Practice with liquids and soft foods that the child likes.
- 2) A closed mouth aids in swallowing.
- 3) An upright sitting position is necessary.

- 4) Quickly stroking the child's throat with ice will induce swallowing.
- 5) Rood facilitation techniques can be used to assist swallowing.
- 6) Gently stroking the child's throat with the fingers in an upward position induces swallowing.
- 7) Rub the cheeks with the fingertips or pinch the larynx.
- 8) Allow the child to feel his throat when he swallows.
- 9) The head must be in a slightly downward position to discourage gulping.
- 10) Heel-pounding of the person in a supine position causes excessive joint compression which activates the midline muscles, especially in the neck and the muscles activated are the ones involved in swallowing.
- 11) Straw drinking is beneficial.

When a child shows signs of sucking his fingers or other objects, lip reflexes have developed. At this time he may be able to withdraw liquids from a bottle by a pressing action rather than actual sucking.

When water and saliva are swallowed without difficulty, a formula is offered in the conventional bottle. Feedings may be gradually thickened and the hole enlarged in the nipple accordingly. Again, the child's body should be in a semireclining position. The following activities were suggested by Zinkus (13) to aid sucking:

- 1) The child must feel secure.
- 2) Head tilted slightly forward, stroke the cheeks lightly before and during feeding.
- 3) A gentle movement of the bottle or straw up, down and sideways in the child's mouth should help the sucking reflex.
- 4) The sucking motion of the lips can be encouraged by closing the lips with the thumb and index finger as the spoon is withdrawn from the mouth.
- 5) Extreme cold is the best temperature to stimulate sucking. Sugar is the most effective taste to stimulate sucking. And the odor stimuli which is most effective is ammonia.

Spoon feeding is indicated when the child easily swallows a thickened formula. The mouth is opened as the spoon touches it and the lips close

upon the spoon. The tongue may be extended if the spoon is withdrawn from the lips. A child also indicates a readiness for spoon feeding when he can smack his lips, manipulate food in the mouth, and has experienced choking.

Once a child is capable of being spoonfed, food should be positioned so that he can put his fingers into it. The child should be told that he is eating. Messiness should be encouraged, as well as any hand to mouth activity.

If the child can not sit unsupported, he can be held on the mother's lap with his back to the mother. The child should grasp the little finger on the mother's hand that is holding the spoon. The child thus learns the hand-to-mouth activity which feeds him. When the child can sit independently or be supported, the mother sits at his right, slightly behind him, and continues the above technique until he can spoon feed alone. If the child shows preference for the left hand, the mother should sit on the left side.

When spoon feeding is being learned, there is a need for large bibs for the mother as well as the child. Newspapers should be placed on the floor. Adaptations may be needed in the child's spoon to facilitate handling. The dish may need to be anchored with suction cups or placed at a ninety degree angle to aid the child in scooping.

Parents must be reassured that tongue protrusion and spitting are a natural part of development and do not indicate a dislike of foods. Likewise, choking is not uncommon.

Both the child and the parent need praise for their feeding efforts. Progress may be slow and the messiness frustrating, but independence in feeding will lead to other areas of self development.

At the time a child is capable of sucking or "nursing" the rim of the cup, cup feeding may be initiated. This indicates a synchronizing of the sucking and swallowing movements. True drinking appears when the child can take two swallows in succession and consume two or more ounces without stopping. To encourage social development, the cup may be offered between meals. At these times the parent may relax with the child. The child should be told that he is drinking and praised for his efforts. The cup may be offered by the same technique as spoon feeding. At first the mother may place her hand over the child's on the cup. Small amounts of fluid are offered at first. Zinkus (13) has provided illustrations of adapted lids and handles for training cups, adjusted spoons for various grasps, as well as types and shapes of feeding dishes and holders for glasses, cartons and bottles (Figs. 2, 3, 4, 5, 6). Other methods for adapting utensils have been reported (41, 42, 43, 44, 45).

### Self feeding

The child indicates a readiness for finger food when he begins to "munch" rather than suck, show an eagerness for food, or fusses if food is slow in coming. Also, he may point to the nipple or other food associated objects with the index finger. Objects at this time are often grasped with a well-defined thumb and finger opposition.

There should be a specific time for self-feeding; a time devoid of distractions. In addition, the child should not be overly tired or stimulated. When the child's interest in self-feeding dwindles, feeding help should be provided. Martin (46) believes that if a child is fatigued



Fig. 2 Adapted lids and handles for training cups (13)

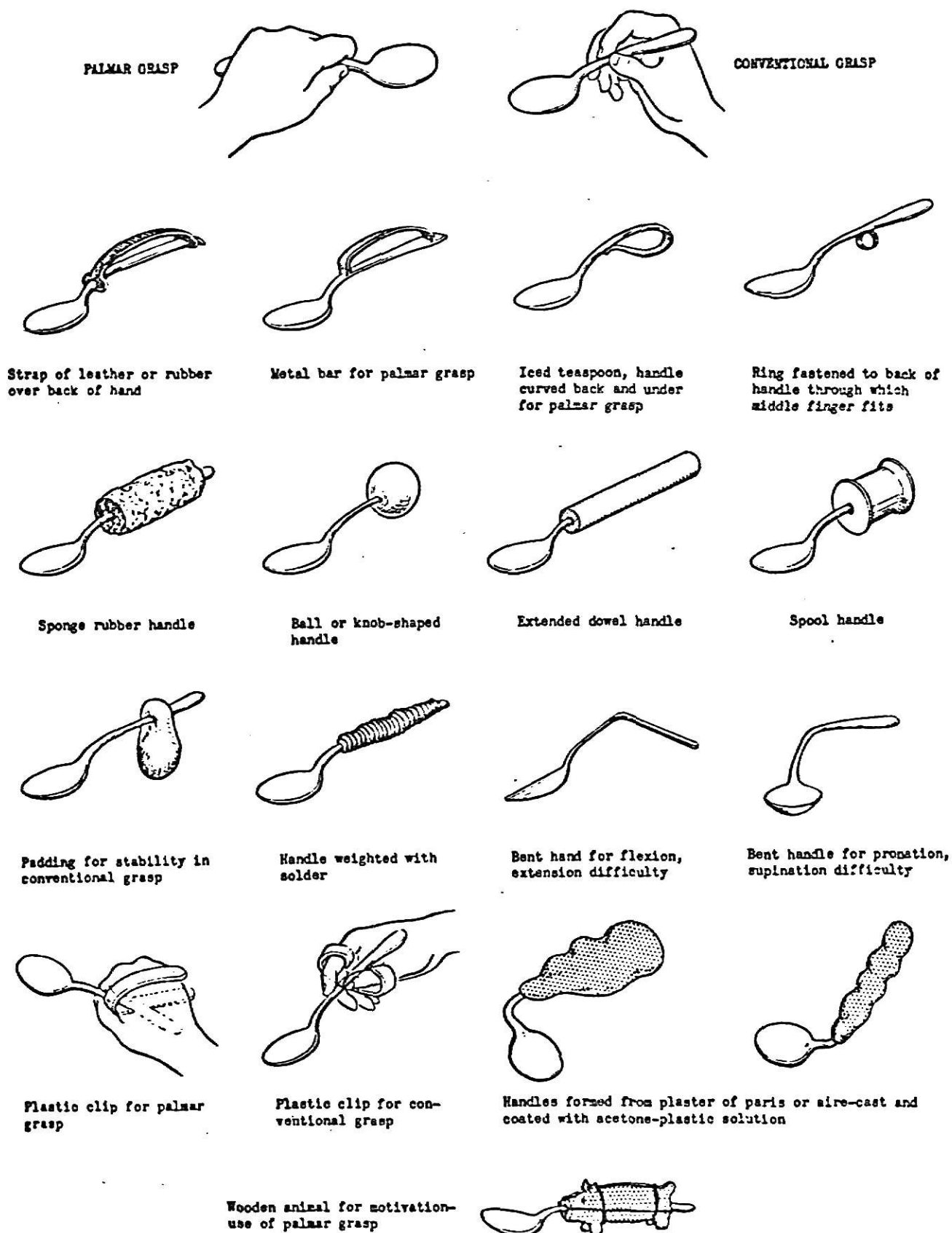


Fig. 3 Adapted spoons (13)

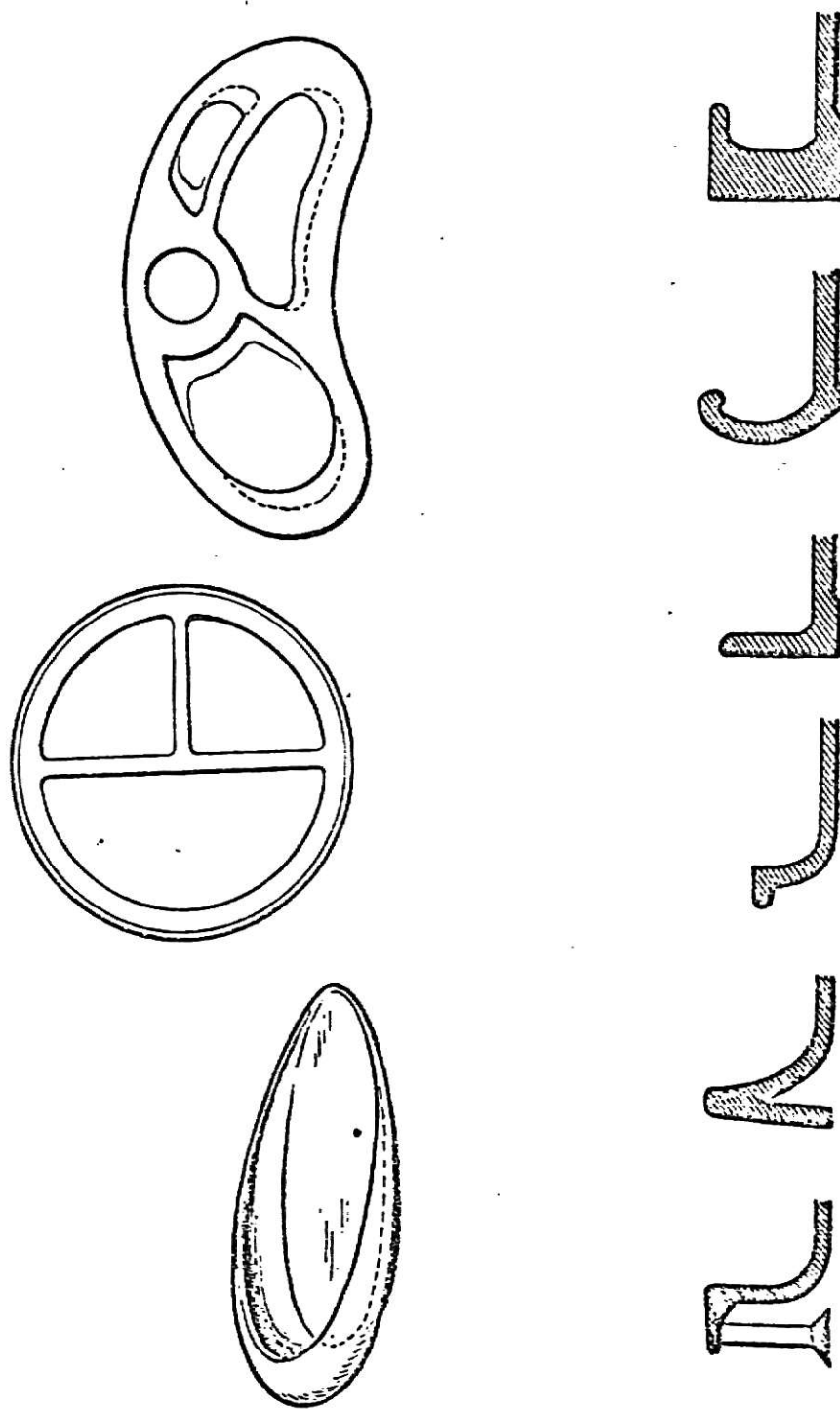
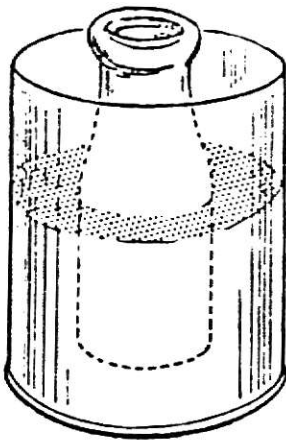
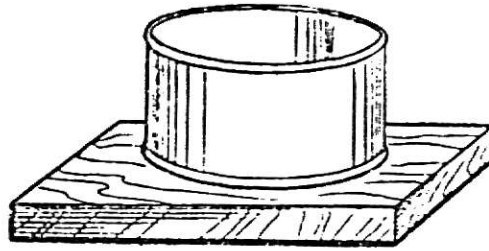


Fig. 4. Types and shapes of feeding dishes and cutaway view of undercuts and sides of dishes (13)

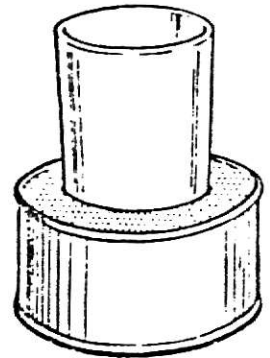




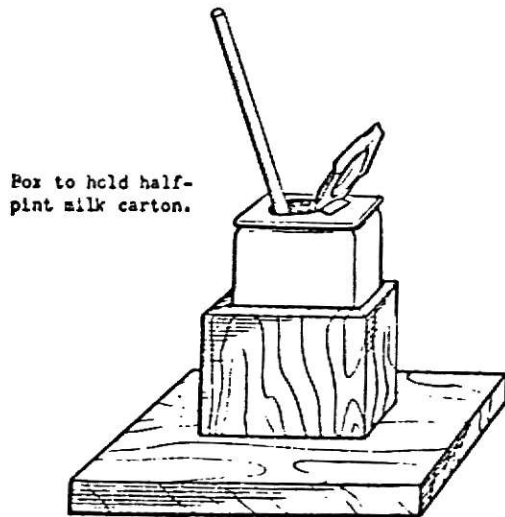
Number 2 can with plaster fill for greater stability.



Tuna can mounted on wooden base.

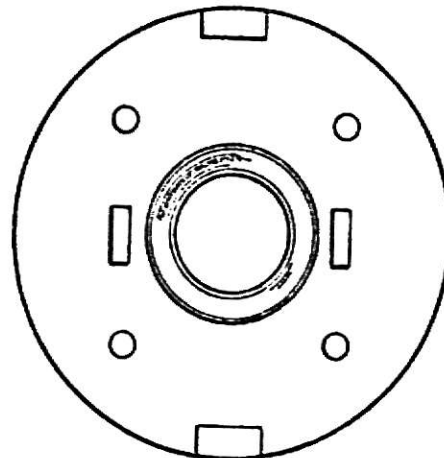
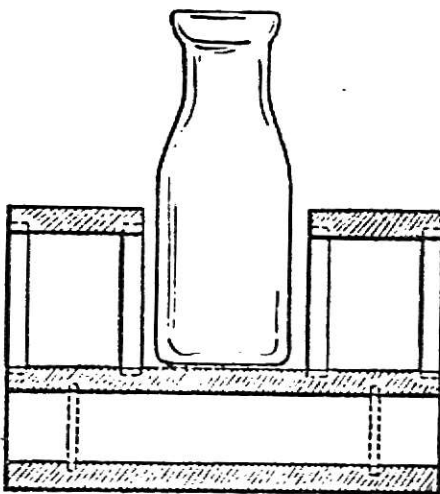
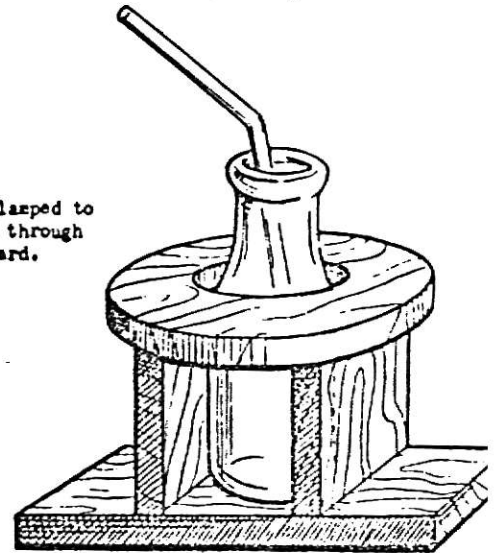


Glass set in tuna can filled with plaster for stability.



Box to hold half-pint milk carton.

Holder which can be clasped to table top or inserted through cut-out of feeding board.



Wooden milk bottle holder stabilizes bottle and raises to correct height.

Fig. 5 Glass, carton and bottle holders (13)

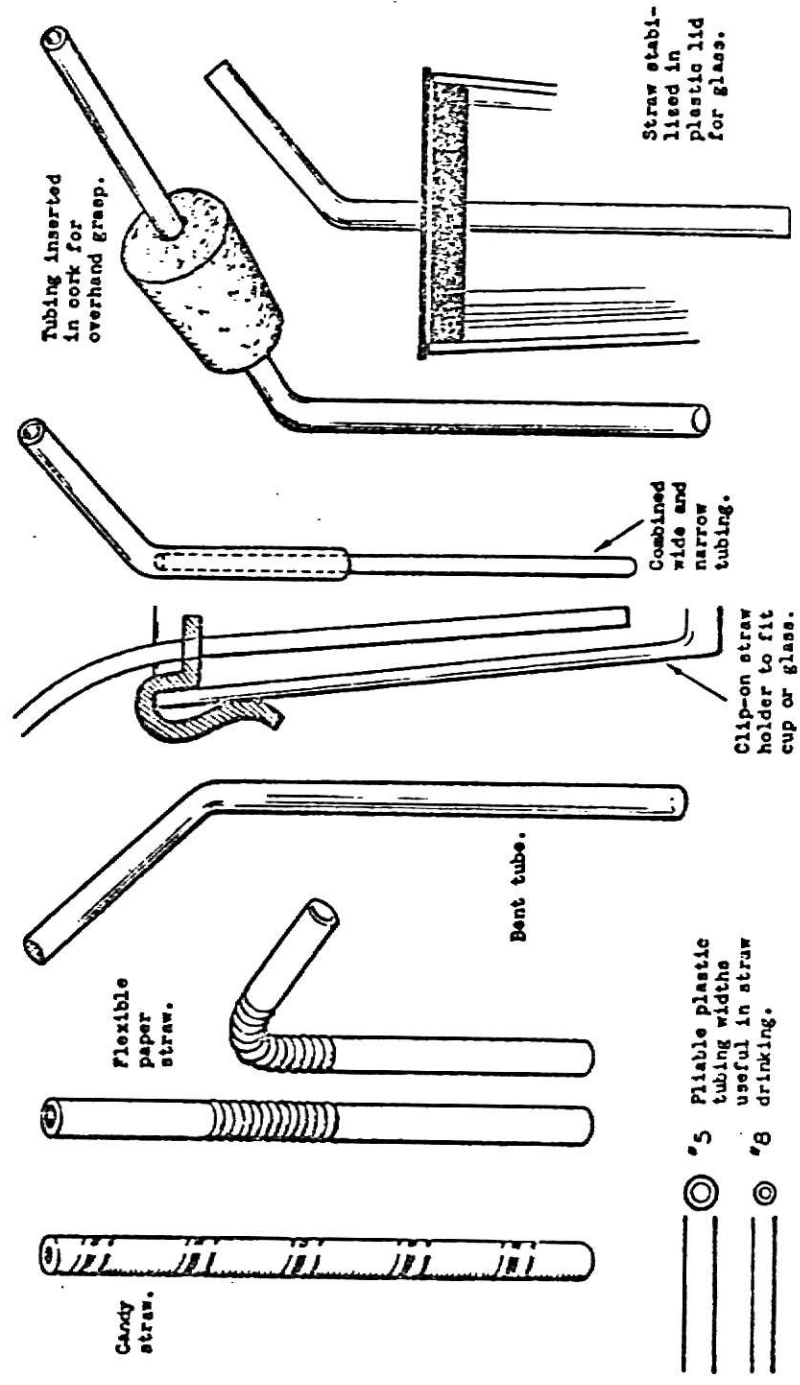


Fig. 6 Straw adaptations (13)

or depressed, the meal should be omitted and supplemented with a concentrated nutritious drink.

New foods are introduced when the child is hungry. Foods should provide a variety of taste, texture, form, and color. Again, the child should be repeatedly told what he is doing. He should be taught to chew by moving his jaws up and down. Zinkus (13) lists the following activities to aid in chewing:

- 1) Encourage the child to chew foods he likes, then to swallow them.
- 2) Stimulate chewing by placing food on the middle of tongue with a slight downward pressure of the spoon.
- 3) Use a verbal command of "open" with the spoon.
- 4) Never put the entire bowl of the spoon inside the mouth.
- 5) Hold the child's lips together while he chews.
- 6) Tapping under the chin facilitates a reflex closure of the mouth.
- 7) Rood facilitation techniques can be used to aid jaw stability and chewing.
- 8) Press down on chin to close the jaw.
- 9) Initiate chewing actions by pushing the jaw up and down.
- 10) Stimulate chewing by pressing back on the chin and firmly rubbing the cheek at the back of the jaw.
- 11) Show the child how to chew and let him feel your jaw as you chew.
- 12) Using a tongue depressor, place food in the child's mouth well back to the side between the molars.
- 13) A gum bag attached to a string may be used to practice chewing.
- 14) Straw drinking will aid chewing.
- 15) To strengthen more muscles for chewing, feed alternately from the right and left sides of the mouth.
- 16) Food should not be wiped away from the chin while the chewing and swallowing activity is in progress since the child must have his entire mouth free for the process of eating.

For proper finger feeding, the child should be in an appropriate and comfortable position. If necessary, head support should be provided. If

the child is unable to sit, he may be placed on his stomach with a pillow under his chest. Parents need to be reassured that the child is physically able to feed himself. They should feel an appreciation for his progress, no matter how slight. Help for routine activities may be needed to enable the feeding process to be conducted without distractions.

The child shows an indication for self-spoon feeding when he can rub a spoon back and forth on the tray, can turn pages in a book, can stack two blocks, and can let go of an object to someone else. For grasp and release activities, Zinkus (13) mentions the following: finger puppets; squeezing clay, a wet sponge or a rubber ball; holding materials of various textures; clapping the hands; shaking and stacking the hands; making use of the position of fingers in hand games; and the release of objects upon request.

At the start of self-feeding, servings are small. Foods which easily adhere to the spoon--squash, mashed potatoes, oatmeal, creamed puddings, etc.--are utilized. Liberal praise for accomplishments with no disapproval for mishaps should be offered. The use of mirrors may be helpful to stimulate interest and promote neatness. However, the use of a mirror may be confusing to the child while he is learning the pattern of motion or if there are perceptual difficulties.

If possible, the child should be allowed to hold the spoon himself. The mother may sit behind the child and assist only in filling and guiding the spoon to the child's mouth. A plate with raised edges secured with suction cups is often helpful. Ten steps for a good progression for independent feeding are listed in Table 6.

TABLE 6  
Ten steps for a good progression for  
independent feeding (13)

Observation of child	Note to parent
1. Good hand-to-mouth motion	For stabilization of shoulder girdle, cup one hand over the child's shoulder and guide his arm at the elbow. Repetition and gentle encouragement important. Toy windmills and bubble blowing, whistles and harmonicas encourage hand-to-mouth motion.
2. Takes food to mouth with fingers unassisted	Give easily handled finger foods: toast, bacon, banana slices, cheese, crackers, orange slices.
3. Picks up spoon unaided	Use built-up spoon handle for weak grasp. Use splint or palmar band for poor grasp. Use extended handle if range of motion small. Use swivel spoon if tendency to tip spoon.
4. Lifts spoon to mouth	May require initial guidance. Use substances the child is fond of: applesauce, honey, ice cream, pudding, etc.
5. Fills spoon unaided and self-feeds independently	Special adaptations may be needed to keep the plate on the table and to get food on spoon.
6. Uses fork unaided	Practice on bread covered with peanut butter which has been cubed. Handle may need to be adapted for grasp.
7. Picks up and releases spoon or fork	
8. Grasps cup and drinks unaided	Begin with paper cup or soft plastic glass.
9. Able to use all utensils and cup	Mirror may aid in pointing out areas of improvement to the child.
10. Ready to use knife for cutting and spreading	When child has one usable arm, a rocker knife is called for.

### Operant conditioning

As previously stated, one of the most important skills to be acquired by the mentally handicapped, whether institutionalized or noninstitutionalized, is that of self-feeding. Research related to motivational and emotional factors in the performance of the mentally handicapped individual is more suggestive than conclusive (47). Important factors in determining the level of functioning are the amount of social deprivation experienced; the desire for interaction with adults; the expectancy rate of failure; the type of reinforcement; reliance on external cues of adults; and the general effects of institutionalization.

Over the past twenty years there has been a strong interest in the field of mental retardation by those using an approach called operant conditioning. This technique attempts to describe in behavioral terms responses (i.e., behavior of the retarded individual) emitted and what happens as a consequence (48).

Operant conditioning can be utilized with the mentally retarded since it is assumed that low performance is due to inappropriate learning. With operant conditioning, the proper cues are provided to increase the likelihood of correct responses and to control the consequences. A reinforcer is "any event which increases the future likelihood of the response" (48). Positive reinforcers to use with mentally handicapped children may be tokens, tangible or activity reinforcers, or social actions (49). It is of prime importance to identify and make use of proper incentives that will improve the behavior of the mentally handicapped child.

Some of the teaching-learning principles derived from the operant theory are (48):

- 1) Teaching is not attempted until situational cues are favorable for the desired response.
- 2) Only those responses which meet the desired standard are reinforced. Instruction is begun at the child's functional level.
- 3) Reinforcement of closer and closer approximations is a more efficient means of promoting complex behavior than waiting for it to occur.
- 4) A wide selection and variation of reinforcing conditions are provided.
- 5) Inappropriate behavior that is not dangerous is to be ignored.
- 6) Behavior problems are composed of cues, the behavior, and the consequences.
- 7) Reinforcements should be given promptly.

Through the use of operant conditioning techniques, Leibowitz and Holcer (10) have shown that the retarded can accept an increasing variety and texture of foods while developing appropriate self-feeding skills. Additional progress in other self-help areas usually follows. Numerous studies (50, 51, 52, 53, 54, 55, 56, 57, 58) concerning self-feeding behavior have described the procedures of operant conditioning: reinforcement, shaping, fading and eliminating undesirable behaviors. Operant conditioning is a multidisciplinary problem and involves the cooperation of a psychologist, occupational therapist, physical therapist, nurse and nutritionist.

In a study conducted by Berkowitz, Sherry and Davis (59), the self-feeding task was divided into the following seven discrete steps, with each succeeding step requiring the child to perform more of the process himself:

- 1) Aide, holding child's hand with spoon in child's hand, makes entire feeding cycle, from plate (scooping food) to mouth and back to plate.
- 2) Aide makes entire feeding cycle, but partially releases child's hand (still holding spoon with food on it) 2-3 inches below child's mouth.
- 3) Aide releases child's hand approximately 6 inches from child's mouth. Child lifts spoon about 6 inches.
- 4) Aide scoops food, releases child's hand at plate level, child lifts spoon from plate to mouth.
- 5) Aide brings child's hand to plate, releasing hand. Child scoops food, and lifts spoon to mouth.
- 6) Aide releases hand after child has emptied spoon. Child brings spoon down to plate, scoops food, and lifts to mouth.
- 7) Child executes entire self-feeding by himself.

Berkowitz et al. (59) concluded that "regardless of I.Q., any child physically capable of holding a spoon and raising it from a plate to his mouth is also capable of learning to feed himself." O'Brien and Azrin (60) recognized that a training program dealing with acceptable eating skills must contain 1) acquisition training of proper self-feeding skills and 2) procedures for motivating continued performance of previously acquired skills.

Anderson, Hodson and Jones (61) have provided instructional programming for various eating skills with detailed training procedures broken down into simplified tasks and verbal clues. These include suggested pretests as well as detailed forms for recording behavior. Also, the Virginia State Department of Health has prepared a training guide which lists specific mechanics involved in self-feeding training (62).

In addition to developing self-feeding skills, operant conditioning can also be used to decelerate undesirable mealtime behavior. Henriksen and Doughty (63) listed the most common mealtime disorders among profoundly retarded boys as 1) eating too fast; 2) eating with the hands; 3) stealing



food from others; 4) hitting others at the table; and 5) throwing trays on the floor. Reinforcement procedures included verbal and facial approval as well as pats on the back. It is important for aides working with subjects to be consistent in management procedures. Edwards and Lilly (64) found that orientation and follow-up sessions with supervisors and ward staff personnel in general operant conditioning procedures were beneficial. This resulted in considerable saving of personnel time, health and reduction of meal-time incidents. More recent studies (65, 66, 67) have also utilized operant conditioning techniques to control mealtime behavior.

### Motivation

The inborn personality characteristics of the mentally handicapped child cover the same range as those seen in normal individuals. Wright (67) stated that "there is no direct relationship between motivation and mental level." He reported that the motivation of the mildly retarded (Binet I.Q. 52-68) was not significantly different from that of individuals in the normal I.Q. range. The emphasis, however, changes among the moderately handicapped (Binet I.Q. 36-51) who respond primarily to love.

Zigler (47) has shown that institutionalized retardates are highly motivated and seek social reinforcers. These children often continued with boring tasks for long periods, longer than normal children of the same mental age. They stayed with tedious tasks in order to gain social approval and encouragement. Wright (67) found that "the most widely applicable incentives were praise and encouragement." This is in

agreement with Gunzburg's (68) belief that feelings of pride and achievement create a good motivational atmosphere. Abbas and Donoghue (69) hypothesized that food, used as a positive reinforcement, could be strongly motivating to 20 profoundly handicapped children whose mental age was under 2 years (chronological age 7 to 17 years). He cites as an example the withholding of breakfast until the child demonstrated the correct performance. Other children responded to sights or sounds which stimulated their curiosity. Curiosity is a strong motivating force in animals and normal children (67). Once the child's curiosity is aroused, interest is maintained with "social rewards" of praise and affection. As children respond to social rewards, the need for tangible reinforcement is diminished. Wright (67) believes that love is the strongest motive among mentally handicapped individuals, especially for those who have spent most of their lives in social isolation.

#### ROLE OF NUTRITION IN MENTAL RETARDATION

"Nutrition is one of the environmental factors that can be controlled to help prevent disease and disability and allow recovery from illness and injury" (70). The contribution of nutrition in the prevention of mental retardation has been well documented but the role of nutrition in therapy is at an initial stage and is controversial.

Nutrition may be defined as "the sum of the processes concerned with growth, maintenance and repair of the living body as a whole or of its constituent parts" (71). This involves adequate food consumption, and in addition the proper digestion and utilization of nutrients by the cells.

Any health program which deals with the prevention, treatment and rehabilitation of the mentally handicapped child should make use of available nutritional services. The managing of feeding problems requires the combined contribution of clinic staff, in-patient facilities, and community resources to bring about rehabilitation.

### Malnutrition

Malnutrition results from a failure to meet nutritional requirements and causes impairment, or risk of impairment, of the physical and mental development of the individual. In a child, malnutrition could be an obstacle in reaching his full genetic potential in terms of physical, neurological or behavioral development. Timing, duration and severity of malnutrition are important factors to consider in examining its neurological effects.

The effects of malnutrition on growth and development are well documented (72, 73, 74). Severe malnutrition may cause growth retardation, reduction in brain size and cell number, poor intersensory development, and delays in language and adaptive skills. "The younger the child and the more critical the developmental stage, the more permanent are the effects of nutritional deprivation" (34).

There are many factors which hinder the optimal nutrition of a child, especially one who is mentally handicapped. Inappropriate food intake (primary malnutrition) may be due to any of the following factors (34):

- 1) Lack of knowledge of nutritional principles on the part of the child and/or his parents.
- 2) Lack of concern about the quality or quantity of the diet on the part of the child and/or his parents.
- 3) Behavioral problems manifesting themselves around the area of feeding.
- 4) Intake of substances interfering with digestion or absorption.
- 5) Financial inability to purchase sufficient food.
- 6) Unavailability of appropriate foods.
- 7) Mechanical difficulties in sucking, chewing or swallowing because of neurological impairment involving oral-pharyngeal function.
- 8) Infantilization of the child by the parents in the area of feeding, manifested by prolonged use of the bottle and pureed foods.

Secondary malnutrition exists when there is adequate food intake but the nutrients are not reaching the cells due to internal factors. These may include the following (34):

- 1) Genetic defects resulting in abnormal metabolic pathways may result in intolerance of some nutrients, or an excessive requirement of certain nutrients for normal function.
- 2) Chronic medication may increase the need for certain nutrients by interfering with their metabolism.
- 3) Malabsorption of nutrients from the gastrointestinal tract may cause malnutrition.
- 4) Physiological stress because of illness or emotional problems may increase the need for a variety of nutrients as well as depressing the appetite.

#### Physiological problems

According to Laidler (71), the most frequent physiological problems of the developmentally disabled which are controlled by nutritional treatment are regurgitation and constipation. Other issues include obesity, anorexia nervosa, and dental caries.

Regurgitation. Regurgitation or "spitting-up" can be caused by swallowing air during feeding or crying, gastric distention from

overfeeding or nausea. Self-induced regurgitation may be used as a means of receiving special attention. To prevent the latter problem, Laidler (71) suggested putting a soft mitten on the child's hand or placing peanut butter in the roof of the child's mouth between meals. If the new taste in the mouth gives satisfaction, the child will prefer not to regurgitate.

Ball et al. (75) developed a special feeding technique for chronic regurgitation. During the feeding process there was widespread stimulation of the oral cavity. The spoon full of food was put in the mouth at various locations and moved around, and in and out. This encouraged biting and developed flexibility and sensitivity of tongue and various parts of the mouth. Ball et al. (75) stated that "in many cases vomiting and rumination may be learned maladaptive behaviors that can be modified by appropriate therapeutic manipulation of reinforcing events." Positive social reinforcement may be given for non-vomiting. Restriction of activity can be used as a negative reinforcement. Contingency punishment may also be used. This may take the form of a shock applied to the leg following regurgitation. The purpose of "sensory education" is to break through the barriers of self-stimulation and to teach the individual to respond to a wider range of stimuli.

Jackson et al. (76) found among the mentally handicapped that vomiting after meals and the subsequent reconsumption of the vomitus was more likely to occur if the patient was limited to single portion meals with food available only at regularly scheduled times. Jackson hypothesized that "vomiting and the subsequent reconsumption of vomitus that occurs

after meals is more likely to be reinforcing if the individual is in a state of food deprivation." A food satiation procedure which allowed the individual to eat as much food as he could consume at meal time as well as a milkshake 90 min after mealtime reduced the incidence of vomiting. In satiation procedures, an excessive amount of the reinforcer is presented in order to decrease the probability of a response occurring which was maintained by the reinforcer.

If regurgitation is not self-induced it may be controlled by making use of high carbohydrate foods. Foods used are those recommended for the "morning sickness" of pregnancy, i.e., crackers, jelly, hard candies and dry toast. Fluids should be given between meals rather than with meals. However, if dehydration is a problem, fluids should be administered in the form of ices, jello and sherbet or other solids that become fluid at body temperature. Gastric distention may also be prevented by six small feedings rather than three large meals. Laidler (71) stated that "the high-carbohydrate low-fat diet has proven to be successful in the prevention of regurgitation." Fasting and skipped meals aggravate regurgitation. Food is more likely to be retained if it is appealing. In severe cases, bulk should be restricted to 100 to 200 gm per meal. Dry foods are more readily retained than liquid foods.

Constipation. Constipation may be defined as "infrequent or difficult passage of feces" (71). It may be due to nervous strain, lack of exercise, or lack of ambulation. Chronic constipation often involves change in the musculature of the intestinal tract resulting from a tumor, an obstruction or diverticulitis. Laidler (71) listed five functional causes of constipation in the developmentally disabled. They are: 1) too little fiber

and bulk in the diet; 2) poor personal hygiene--neglecting the urge to defecate; 3) lack of exercise resulting in reduced muscle tone and ability to move the fecal mass at a normal rate; 4) excessive use of laxatives and enemas; and 5) emotional disturbances.

The treatment of constipation is an individual matter. The diet should include adequate roughage in the form of fruits and vegetables as well as whole grain cereals to provide bulk to the intestinal contents. Foods rich in B complex vitamins will stimulate muscle contractions. Other foods to include are those which: ferment (honey, lactose, maple syrup and molasses); contain sulfur (cabbage, broccoli, onions, etc.); include fermentative type of bacteria (sour cream, yogurt, buttermilk); and those foods which serve as lubricants (butter, salad oil, etc.). In addition, an adequate intake of fluids (6 to 8 glasses) is recommended.

Improved health habits include regularly scheduled times for elimination as well as sufficient rest, relaxation and exercise. Meal service at regular times is also beneficial.

Obesity. Another frequent nutritional problem among the mentally handicapped is obesity (weight 20% above normal). Lack of activity and the attitudes of parents are two important causes of this condition. If the child is non-ambulatory and palsy is present, the activity level may be greatly reduced. In these cases parents often serve excess food as a means of providing pleasure to the child. Maintaining proper weight and establishing good eating habits are important factors in a child's physical and emotional well being. Obesity is best reduced and controlled by conscientious application of the principles of good nutrition.

There are specific syndromes that show a tendency toward excessive weight gain. Obesity is a characteristic problem in Prader-Willi Syndrome. The possible defect in the appetite-regulatory center may explain the tendency for these children to eat continually. Pipes and Holm (77) reported on the weight control of children with Prader-Willi Syndrome by severe calorie restriction. Satiety is never achieved with these children; the greatest volume of food needs to be given, but calories limited. Complete environmental control is a necessity. Down's Syndrome is another condition which may be accompanied by excessive weight gain. This may be due to the fact that children with Down's Syndrome have decreased leg growth and appear overweight.

Bufford (78) outlined the causes of obesity in mentally handicapped children as endomorphic body structure (a stocky fat individual with round body features, prominent abdominal viscera, large trunk and thighs, and tapering extremities); low socioeconomic status; limited physical exercise; and parent-child gratification with food. Parents as well as their children need to be motivated and educated. Individuals needing to lose the most weight often have parents showing the least cooperation and motivation. Reinforcement procedures should be utilized when weight loss occurs.

A weight reduction program for the trainable mentally handicapped child was outlined by Springer and Angelocci (79). Here, monthly nutrition classes were provided to mothers along with exercise programs, lunch time nutrition education, meal planning and cooking classes for



children. All of the children learned to eat more nutritious food. However, the older children were more successful in weight control.

Anorexia nervosa. The common definition for anorexia nervosa is:

a mental state characterized by severe rejection of food, resulting in extreme loss of weight, low basal metabolic rate, exhaustion, and sometimes loss of hair. Death may occur from starvation (38).

Schmidt and Duncan (81) stated that "abnormal eating can be viewed as a specific learned behavior that is perpetuated by environmental reinforcement." Changes are made in events which serve as reinforcement. Privileges are withdrawn, daily activities are scheduled, and special rights are restored as goals are met. As the patient gains weight, the privileges are restored by the psychiatrist. A firm but loving parent attitude is needed for success. Self-doubt and low self-esteem must be corrected. The individual is encouraged to express his feelings and opinions openly.

Dental caries. Dental problems in the mentally handicapped child may occur as a result of poor food habits and an inability to chew. Gum disorders and malocclusion are common in the mentally retarded child. Tooth decay is often accelerated by food retention from misplaced teeth as well as an inability to rinse or brush the teeth after meals. The basis for therapeutic recommendations should be made in regard to the child's typical meal pattern and food preferences. The dentist or physician may recommend fluoride application to harden the tooth enamel and prevent decay.

## ROLE OF THE NUTRITIONIST

In 1965, at a time when the needs of the mentally handicapped were reevaluated, Umbarger (81) outlined the role of a nutritionist in clinical services for the retarded and emphasized eight major concepts. These are:

- 1) Gather pertinent information about the child's feeding practices and nutritional state, both past and present.
- 2) Assist in evaluating the child's developmental progress via his feeding abilities and attitudes.
- 3) Participate actively and dynamically in case conferences where a child's problems are considered in total.
- 4) Interact and coordinate efforts with other staff members in order to assure united benefits to a patient.
- 5) Counsel parents in the philosophy of feeding children as well as the practicalities such as food economy, selection and preparation.
- 6) Devise methods and techniques for feeding and nourishing individual children with handicaps.
- 7) Manage prescribed therapeutic diet regimens with a broad sensitivity to the needs of the 'whole child'.
- 8) Prepare educational materials related to nutrition for medical and other professional personnel, parent groups, community health projects concerned with mental retardation and for patient's families.

Nutritionists are currently heavily involved in these eight aspects of care. However, there are now two other areas of concern which require the services of nutritionists. The first is in the area of orthomolecular therapy, i.e., "treating mental illness by providing for the optimum molecular composition of the brain--especially the optimum concentration of substances normally present in the human body" (82). Treatment consists of megadoses of vitamins and minerals. Here, the nutritionist's role includes an awareness of possible symptoms of toxicity resulting from these medications. A summary of these symptoms is included in Table 7. In addition, appropriate dietary modifications are often indicated and recommended to caretakers.

TABLE 7  
Vitamin and mineral deficiency and toxicity  
symptoms related to nervous system structure  
and function \*

	Deficiency	Toxicity
Vitamin A	Congenital malformation, incoordination and ataxia in young animals.	Hydrocephaly and congenital malformation in rats, excess irritability in infants, lethargy, depression, malaise in man.
Thiamin	Glial cell changes in rats. In man, Wernicke's encephalopathy; degenerative changes (demyelination) in nervous tissues resulting in disturbance of nervous function, anxiety, irritability, depression and increased sensitivity to noise and pain.	
Riboflavin	Congenital malformations, EEG abnormalities, severe paralysis of limbs in man, polyneuropathies and nerve lesions in animals.	Congenital malformations and convulsions in animals.
Niacin	Personality changes: lassitude, apathy, apprehension and depression. Pellagra-symmetrical polyneuropathy in man (paraesthesia, burning feet).	Flushing nervous panic in man.
Pyridoxine	Hyperirritability and convulsion in infants; sensory polyneuropathy in man; severe organic lesions of peripheral nerves and diminished brain weight in rats; encephalitis in young animals.	
Folic acid	Congenital malformations, fetal brain damage and delay in maturation of brain function in man and rats.	

TABLE 7 (cont'd)

	Deficiency	Toxicity
Vitamin B <sub>12</sub>	Demyelination of spinal cord (man) resulting in peripheral nervous symptoms such as mental confusion; hydrocephaly in animals.	
Pantothenic acid	Sensory over-excitability and spontaneous, painful, burning; paresthesia in man (burning feet).	
Biotin	Impaired avoidance learning in rats, depression, malaise and neuropathy in man.	
Pteryl-glutamic acid	Organ malformations (functions as antagonist to folic acid).	
Vitamin D		Irritability in children, hypercalcemia in utero causes elfin faces and mental retardation in man.
Vitamin E	Encephaly in young animals.	
Vitamin K	Cerebral hemorrhage in infants	Mental retardation, spasticity in newborn infants. Congenital malformations.
Copper	Swayback or enzootic ataxia; symmetrical demyelination of CNS in lambs and guinea pigs. Menkes Steely Hair Syndrome in infants.	Neurological degeneration as seen in Wilson's disease.
Iodine	Physical and mental languor.	
Iron	Apathy, motor restlessness, lethargy, short attention span in children.	
Magnesium	Tetany-like symptoms in infants, muscular twitching, delirium, hallucinosis, apprehensive behavior and convulsions, tremor, bizarre behavior in man.	Motor and respiratory paralysis in premature newborns.

TABLE 7 (cont'd)

Deficiency		Toxicity
Manganese	Congenital ataxia in rats characterized by abnormal body righting reflexes.	
Sodium		Brain damage in infants and children through disturbance of extracellular osmolality mechanism as seen in infection.
Zinc	Gross congenital malformations, hydrocephaly and other brain anomalies in animals.	

\* Springer, N. S., Personal communication, April, 1977.

The second area of concern deals with nutrient deficiencies that result from extended drug therapy. Examples of some nutritional side effects have been reported by Springer (personal communication, April 1977). Significant suppression of growth in height and weight occurs in children on CNS stimulants (83). Weight loss has been attributed to anorexia or appetite suppression resulting from drug therapy. Anti-convulsants have been shown to cause deficiencies in serum folic acid (82, 85). Neubauer (87) recommends the administration of 5 mg folic acid per week and 250 mg of vitamin B<sub>12</sub> per month for individuals receiving anticonvulsant therapy. Supplementation of vitamin D has also been suggested when anticonvulsants are prescribed over a period of time (82, 86). Deficiencies of vitamin B<sub>12</sub> have also occurred (83). Bowden (88) reported low serum calcium, elevated alkaline phosphatase levels and radiologic bone findings indicative of rickets or osteomalacia in institutionalized epileptic patients. Numerous metabolic alterations resulting from drug therapy have caused The American Dietetic Association to publish the handbook, "Interactions of Selected Drugs with Nutritional Status in Man" (89).

Christakis et al. (90) investigated the relationships between drugs, nutritional status, and nutrients. Since drugs may affect nutrient absorption, appetite, gastrointestinal motility, gastrointestinal flora, nitrogen balance and electrolyte balance are involved. He concluded that "the complex relationships between drugs, nutritional status, and nutrients is a relatively unexplored field which is ripe for further investigation."

Egan (91) expressed the opinion that nutritionists and dietitians need to assume responsibility in rehabilitation programs. In order to do this, they should:

- 1) Know what is being done in rehabilitation.
- 2) Assume more initiative in making themselves and their services known to rehabilitation programs.
- 3) Seek adequate training in the concepts, techniques and resources in rehabilitation so that they are well prepared and can work side by side with the other disciplines.
- 4) Join forces with other professional groups and organizations concerned with rehabilitation.

Present day nutritionists are obligated to become involved with disciplines other than their own. Title V, Section 511, of the Social Security Act (92) authorizes grants for training personnel in health care and related services, particularly with mentally retarded children and children with multiple handicaps. Grants are used to provide 1) interdisciplinary training for professionals, 2) individualized treatment for children to allow each to reach his highest potential and 3) information concerning the implications of research in the areas of training and service.

It is Baer's (34) belief that the role of the nutritionist working with developmentally disabled children has two dimensions. First, nutritional assessment, which determines the past and present status of the child, and secondly, the aspect of prevention of nutritional deficiencies. Both are of high priority. He stated: "the ultimate goal is to prevent further disability because of the loss of vitality and health occasioned by poor or marginal nutritional status and at the same time to maximize the potential of the child" (34).

## SUMMARY

The subject of the mentally handicapped child has been introduced by defining conditions and related terms. Methods of classifying mental retardation by cause, characteristics and degree are presented. The incidence is stated for mental retardation in children up to 18 years of age in this country.

Six developmental factors involved in feeding children, especially the mentally handicapped, are discussed. A detailed interdisciplinary evaluation of these developmental factors is described for determining feeding skills which individuals are capable of achieving. Since optimum nutrition is essential to physical and mental development, the significance of an adequate feeding pattern at the earliest possible age is outlined.

The causes and symptoms of nutritional deficiencies are explored. Assessment of a child's eating habits includes a dietary evaluation and analysis of the adequacy of individual nutrients consumed. The nutritional requirements for a mentally handicapped child are altered since he is often small for age and involved in abnormal activity. Genetic or chemical abnormalities may also alter nutrient requirements.

Techniques and teaching methods for increasing skills which lead to self-feeding are presented. Breaking down tasks into discrete steps, repetition, patience and reinforcement are essential for a successful program. Parents and professionals alike must be sensitive to the child's readiness to change. Through the use of operant conditioning



techniques and suitable motivation, the mentally handicapped child can develop self-feeding skills. This then allows for treatment to be concentrated in other areas. Many learning opportunities are provided by the feeding situation. The child can be stimulated in areas of physical, psychological and social development. Through meal service and variety in color, textures and flavors of foods, the retarded child may receive the appropriate social stimulation necessary for effective social functioning. This, in turn, contributes to the total development of the child.

Factors which interfere with the optimal nutrition of a child are reviewed. Physiological problems controlled by nutritional treatment are regurgitation, constipation, obesity, anorexia nervosa and dental caries.

Feeding the mentally handicapped child involves the knowledge and skills of an interdisciplinary team composed of physician, nurse, social worker, psychologist, speech therapist, physical therapist, occupational therapist and nutritionist. Therefore, the nutritionist needs to be aware of the many resources which are available for assessing the dietary needs and feeding problems of the mentally handicapped child. In addition, appropriate parental education needs to be provided. Knowledge of dietary and feeding needs are important aspects of teaching the handicapped child. The role of the nutritionist in serving the needs of the mentally handicapped is outlined with emphasis placed on preventing further disability and maximizing the potential of each child.

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MENTALLY HANDICAPPED CHILDREN:  
FEEDING AND NUTRITIONAL CARE

by

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AN ABSTRACT OF A MASTER'S REPORT

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MASTER OF SCIENCE

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A review of the literature related to factors involved in the total assessment of the mentally handicapped child is presented. Mental and developmental factors are related to feeding and nutritional care. Detailed feeding techniques for the child and his caretaker are described in individual steps. Many of these are success-assured activities based on the child's performance level. The acquisition of self-help skills gives the mentally handicapped child feelings of confidence and independence.

The significance of nutrition in treating the developmentally disabled child is now recognized. Hence, the nutritionist, as a member of a multidisciplinary team contributes towards care goals of preventing further disability and maximizing the potential of the exceptional child.